

NASA Reference Publication 1074

**Preliminary Vibration, Acoustic,
and Shock Design and Test Criteria
for Components on the Lightweight
External Tank (LWT)**

Staff of Systems Dynamics Laboratory
Marshall Space Flight Center

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Preliminary Vibration, Acoustic, and Shock Design and Test Criteria for Components on the Lightweight External Tank (LWT)

Staff of Systems Dynamics Laboratory
George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama



National Aeronautics
and Space Administration

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PREFACE

The vibration, acoustic, and shock design and test criteria presented in this document are based on the latest LWT structural configuration and will be updated as further design information and vibroacoustic data become available.

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ABBREVIATIONS

D. A. Disp.	Double Amplitude Displacement
dB	decibel
dB/oct	decibels per octave
ET	External Tank
G	unit of acceleration (32.2 feet per sec ²)
g ² /Hz	acceleration spectral density
g _{rms}	root mean square acceleration
G's peak	peak acceleration
Hz	Hertz (cycles/sec)
in.	inch
lb	pound
MSFC	Marshall Space Flight Center
sec	second
SPL	Sound Pressure Level
SRB	Solid Rocket Booster
SSME	Space Shuttle Main Engine
X _t	X-Axis of ET
Y _t	Y-Axis of ET
Z _t	Z-Axis of ET

SECTION I. INTRODUCTION

This document presents the vibration, acoustic, and shock design and test criteria for components and subassemblies on the Lightweight External Tank (LWT). Also presented are specifications for transportation, handling, and acceptance testing. Subzones (General Specifications) are presented for all locations. Specifications are also presented for some specific components and subassemblies.

The specifications cannot provide all the information necessary for qualification testing of each individual component and subassembly. Consequently, this document must be used under the cognizance of qualified dynamics and test engineers. The originating agency, ED23, will assist in the proper use of these specifications.

SECTION II. VIBRATION AND SHOCK QUALIFICATION TEST REQUIREMENTS AND PROCEDURES

The following requirements and procedures apply only to qualification testing:

A. Specimen

The specimens will be production components in accordance with current manufacturing drawings. Supporting brackets and component attachment hardware (lines, valves, etc.) will be included in all tests to achieve dynamic similarity to actual installation. Hardware so included in the test setup is considered part of the test specimen.

B. Fixture

The fixture will support the specimen in the manner simulating actual installation. The fixture will be designed to minimize fixture response at resonances within the test frequency range.

The fixture design and specimen installation should be approved by responsible dynamics and test engineers prior to testing.

C. Test Specimen and Fixture Resonance Survey

A sinusoidal resonance survey test is recommended in the fixture and instrumentation diagnostics process and in developmental testing. The recommended sweep rate is 1 oct/min from 5 to 2000 to 5 Hz at the following amplitudes:

- 5 - 62 Hz @ 0.0050 in. D. A. Disp.
- 62 - 2000 Hz @ 1.0 G's peak

D. Test Amplitude

All component test amplitudes will be applied as inputs to the component bracketry at the interface of the bracketry and the test fixture. The inputs will be applied along each of three mutually perpendicular axes as referenced to the interface of the component and the vehicle primary structure. The control accelerometer will be mounted on the test fixture at the point where the test specimen or specimen supporting bracketry attaches to the test fixture.

E. Test Sequence

The qualification testing order for the components on the ET will be:

- o Acceptance Vibration Test (when required) (Section VI)
- o Flight Random Vibration Test (when specified)
- o Lift-off Random Vibration Test
- o Boost Random Vibration Test
- o Vehicle Dynamics Test
- o Shock Test
- o Acoustic Test (when specified)
- o Transportation and Handling Tests (when specified)

Acceptance testing, when required, should be completed in all three axes prior to any other qualification testing. All random vibration, vehicle dynamics, and shock testing should be completed in one axis before proceeding to the next. When shock testing is performed on separate test equipment, all vibration testing will be completed prior to shock testing.

F. Functional Performance

Specimens that function in the dynamic environment will perform to their functional specifications prior to, during, and after each qualification test.

G. Random Vibration Tests

Test equipment equalization will be accomplished by either of the following methods:

- o Obtaining initial equalization by using actual test specimens and reduced vibration inputs. Final equalization will then be obtained by applying short duration excitation to the specimen at the specified test amplitudes.
- o Subjecting a mass simulated dummy component to the specified test inputs as in the above method. After equalization, the dummy component will be replaced by the actual component, and equalization verified by applying short duration excitation at the specified test amplitudes.

Test amplitudes and durations are provided in the applicable specifications. Test setup and equalization times should be minimized. Neither of these time durations will be considered part of the specified test duration.

H. Vehicle Dynamics Test

Test amplitudes are provided in the applicable specifications. The specified frequency spectrum will be swept logarithmically at the rate of 3 oct/min as described below:

- o Sweep from the low frequency to the high frequency one time in each of the vehicle axes.

J. Shock Test

Shock pulses or spectra are stated for each specification. When two shock criteria are specified for a component, only the maximum shock spectrum should be used. Any pulse that results in a spectrum within the test tolerances at every frequency of the specified shock spectrum is acceptable. Either mechanical or ordnance shock testing is acceptable. During mechanical shock testing, the test specimen will be subjected to two shocks per mission in each axis (equivalent to one in each direction) for a total of six shocks per mission. During ordnance shock testing, the specimen will be subjected to one shock per mission, which must satisfy the applicable specifications in at least one axis.

K. Combined Environments

Vibration, shock, and acoustic testing under various combined environments will be specified, when required, by the responsible Marshall Space Flight Center (MSFC) organization.

L. Test Tolerances

The test spectra shall be verified by narrow band spectral analysis using an analysis system that is independent from the analyzer/equalizer used to control the test. Tolerances considered acceptable are as follows:

o Vibration	±10%
Composite Root Mean Square Acceleration	
Acceleration Spectral Density	+100%
(Tolerances pertain to bandwidths of 25 Hz or less)	-30%
Sinusoidal Peak Acceleration	+20%
	-10%
Sinusoidal Control Signal Maximum Harmonic Distortion	±10%
Frequency	±5%
Test Duration	+10%
	- 0%
o Shock Spectrum	
Spectrum Peak Acceleration	+40%
(When analyzed with a 1/3 octave shock spectrum analyzer and 5 percent damping.)	-20%
o Shock Pulse	
Amplitude	+40%
	-20%
Duration	±10%

M. Failure Determination

A specimen will be considered to have failed a particular test if the specimen malfunctions during or after the test, or if post-test prescribed inspection reveals structural damage. All test failures will be reported immediately to the originating agency (ED23).

N. Deviations From Specifications

Deviations from these specifications may be obtained only from the originating agency (ED23). All deviations will be stated in the test report.

O. Test Reports

A report will be submitted to the originating agency by the testing agency describing in detail the tests performed and the results of the tests. The report will include drawings, sketches, and photographs, showing in detail all measurement locations. The report will include all calibration and measured test levels and any other information pertinent to the acquisition, reduction, analysis, and interpretation of the test data. Equalization levels and durations will be included.

Progress reports will be provided to the originating agency as requested.

SECTION III. SELECTION OF APPLICABLE VIBRATION AND SHOCK SPECIFICATIONS FOR STRUCTURALLY MOUNTED COMPONENTS

The selection of the correct qualification specification is essential in developing confidence and reliability in the component. The following general discussion should be considered before making such a selection.

A zonal technique has been used in generating and presenting the qualification specifications. Using this technique, the Space Shuttle LWT has been divided into zones and subzones (Figures 1 through 5) as determined by the responsible MSFC organization. Where applicable, each subzone was further divided into subzone weight ranges or major components.

Three distinct types of component and subassembly qualification specifications are presented:

- o Subzones (General Specifications)
- o Subzone Weight Ranges
- o Specific Component Specifications

A Subzone (General Specifications) pertains to all components and subassemblies mounted on a particular type of structure. These specifications are labeled "General" because they are applicable to all components and subassemblies in that subzone. General Specifications are based on the vibration environment for all structures within the subzones. Consequently, General Specifications usually result in more severe qualification specifications than weighted specifications. General specifications should be used only when Subzone Weight Ranges and Specific Component Specifications cannot be used.

Specifications for subzone weight ranges and major components have been determined wherever practical. These specifications pertain to certain items (components, subassemblies, panels, etc.) located within a specific subzone, and may be distinguished by the absence of the notation "General Specifications" and the inclusion of a letter suffix (-A, -B, etc.) in the specification number. These specifications are based on vibration environments for various types of local structures (skin, stringer, ring-frame, panels, etc.).

In general, specifications for individual components are based on the component's weight, location, and mounting configuration and can be found in the appropriate subzone. Specifications for selected LWT components are included in Appendix A.

The appropriate qualification specification may be determined for a particular component or subassembly by the following procedure:

- o Determine if a specific component specification exists; if not:
- o Identify the zone in which the component or subassembly is located;
- o Within this zone determine the subzone in which the particular component or subassembly is located;
- o Identify the subzone specification corresponding to the weight of the component.

SECTION IV. ACOUSTIC TEST REQUIREMENTS AND PROCEDURES

A. General Requirements

All structures and components requiring acoustic testing will be subjected to either broadband reverberant field or progressive wave testing. The acoustical random noise source for either type test will have an approximate normal amplitude distribution. Reverberant field testing is preferred for both structures and components. However, structural panels as well as components may be tested using progressive wave facilities where this type of test is justified.

B. Specification Selection

A zonal technique has been used in generating and presenting the qualification specifications. Using this technique, the LWT has been divided into zones and subzones as shown in Figures 1 through 3. Acoustic test specifications for each of these general zones are provided in Section VIII.

The appropriate qualification specification can be determined by identifying the zone or subzone in which the component is located.

C. Reverberation Chamber Facilities

The test chamber will be of sufficient volume and dimensions to ensure that the insertion of the test specimen will not affect the generation and maintenance of a broadband diffuse sound field above 50 Hz. Normally, the test specimen will be suspended in the center of the test chamber with soft suspension cords. The suspension system will have a fundamental frequency of less than 25 Hz.

The sound field in the proximity of each major surface of any test specimen that will be subjected to external acoustic environments will be determined by either flush mounted microphones or microphones mounted approximately 0.25 in. from the specimen surface. These microphones may serve as the control measurements. When the placement of these microphones is not feasible or will compromise the test results, at least three microphones located in the field will serve as control measurements. These microphones will not be located in close proximity to any surface within the test chamber. The control measurements, whether flush mounted or field located, will be averaged to determine the sound field.

With the specimen in the test chamber, the sound pressure level spectrum will be shaped at a level approximately 6 dB less than the specification. The time required to shape the spectrum will be minimized to avoid possible overstressing of the test specimen. After completion of the spectrum shaping, the sound pressure level will be increased to the

specified value, and the test will commence. As an alternative to reducing the sound pressure level while shaping the spectrum, a dummy specimen may be positioned in the test chamber, and the spectrum shaped at the test level. When the spectrum shaping has been completed, the dummy specimen will be replaced by the test specimen, and the test will commence.

D. Progressive Wave Facilities

The structural panel specimens may be tested in progressive wave facilities. The test specimen will be centrally mounted in the wall of the progressive wave duct. The width of the wave duct will be of sufficient distance to ensure minimum effects on the panel response characteristics.

Components may be tested in progressive wave facilities. The specimen will be centrally located in the progressive wave duct and suspended by a system having a fundamental frequency of less than 25 Hz. The cross section of the progressive wave duct will be of sufficient area, relative to the frontal area of the test specimen, to ensure that the insertion of the test specimen will not affect the generation and maintenance of the progressive wave. The test specimen will have each major surface exposed to the sound field by orienting each major surface parallel to the progressive wave front. Each major surface will be exposed to the sound field for the full test duration.

For both types of progressive wave testing, the sound pressure level spectrum will be shaped without the test specimen in place. The uniformity of the sound field will be determined by locating at least three microphones in the proximity of the duct cross sectional plane where the test specimen will be mounted. After mounting the test specimen, the sound pressure level will be reestablished, and the test will commence. Alternatively, for structural panel specimens, the sound pressure level may be shaped at a level 6 dB less than the specification. The time required to shape the spectrum will be minimized to avoid inadvertent overstressing.

E. Tolerances

The test time will be within plus 10 to minus 0 percent of the time stated in the specification. The overall sound pressure level and the individual 1/3 octave band sound pressure levels will be within plus 2 to minus 2 dB of the specification. The sound pressure level tolerance applies to the frequency range of 50 through 10,000 Hz. Below this frequency range, the capability of the testing facility will be the governing factor.

The test spectra shall be verified by narrowband spectral analysis using an analysis system that is independent from the analyzer/equalizer used to control the test.

SECTION V. TRANSPORTATION AND HANDLING TEST REQUIREMENTS AND PROCEDURES

Transportation and handling specifications should be used for designing and testing component shipping containers. These specifications should not influence component design, but should provide information for shipping container design to ensure that the vibration amplitudes transmitted to the component do not exceed the design amplitudes.

A. Transportation

Transportation specifications are generally presented as amplitudes in G's peak for sinusoidal sweep tests. Components should be monitored for resonance; dwell tests of 15 min each are required at each major resonance as noted during the sweep. If a component is shipped by rail, a shock test will be required to represent the train humping conditions. Any shock pulse may be used that results in a spectrum at least as severe as that specified.

Transportation tests may be eliminated if proof of adequate component protection can be provided.

B. Handling

Handling specifications are required to account for typical conditions that occur during loading or unloading operations. Tests for these conditions consist of numerous container drops from various orientations of the container.

Handling tests may be eliminated if proof of adequate component protection can be provided.

SECTION VI. ACCEPTANCE TEST REQUIREMENTS AND PROCEDURES

The requirement to do acceptance testing will be established for each program by the project manager. This document does not establish the requirement to do acceptance testing; however, it does give the acceptance test levels to be used if acceptance testing is required. If acceptance testing is required on the flight hardware, it will also be required on the qualification hardware. Acceptance test levels will be 6 dB below the qualification composite level.

Test procedures and tolerances will be the same as specified in the appropriate sections of this document.

SECTION VII. VIBRATION AND SHOCK SPECIFICATIONS

Zone 1 Et LH₂ Aft Bulkhead

Subzone 1-1 ET LH₂ Aft Bulkhead Gores (General Specifications)

Same as Subzone 1-1-A below.

Subzone 1-1-A Input to Components Mounted on the ET LH₂ Aft Bulkhead Gores. Weight of Component < 8 lbs.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.019 g²/Hz
20 - 110 Hz @ +9 dB/oct
110 - 300 Hz @ 3.12 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.47 g²/Hz

Composite = 49.6 g_{rms}

Directions B and C

20 Hz @ 0.018 g²/Hz
20 - 130 Hz @ +6 dB/oct
130 - 340 Hz @ 0.72 g²/Hz
340 - 430 Hz @ +6 dB/oct
430 - 3000 Hz @ 1.15 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.58

Composite = 41.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.076 g²/Hz
20 - 110 Hz @ +9 dB/oct
110 - 300 Hz @ 12.50 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 1.89 g²/Hz

Composite = 99.3 g_{rms}

Directions B and C

20 Hz @ 0.070 g²/Hz
20 - 130 Hz @ +6 dB/oct
130 - 340 Hz @ 2.90 g²/Hz
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ 4.60 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 2.30 g²/Hz

Composite = 83.0 g_{rms}

1-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.37 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +6 dB/oct
 100 - 300 Hz @ $9.0 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $1.4 \text{ g}^2/\text{Hz}$
 Composite = $85.0 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.088 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +6 dB/oct
 120 - 1000 Hz @ $2.9 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 Composite = $68.4 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 1-1-B Input to Components Mounted on the ET LH₂ Aft
 Bulkhead Gores. Weight of Components ≥ 8 but < 25 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 20 - 88 Hz @ +9 dB/oct
 88 - 300 Hz @ $1.56 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.24 \text{ g}^2/\text{Hz}$

Composite = $35.4 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.018 \text{ g}^2/\text{Hz}$
 20 - 92 Hz @ +6 dB/oct
 92 - 340 Hz @ $0.36 \text{ g}^2/\text{Hz}$
 340 - 430 Hz @ -3 dB/oct
 430 - 1000 Hz @ $0.58 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.29 \text{ g}^2/\text{Hz}$

Composite = $29.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.076 \text{ g}^2/\text{Hz}$
 20 - 88 Hz @ +9 dB/oct
 88 - 300 Hz @ $6.25 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.94 \text{ g}^2/\text{Hz}$

Composite = $70.9 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.070 \text{ g}^2/\text{Hz}$
 20 - 92 Hz @ +6 dB/oct
 92 - 340 Hz @ $1.45 \text{ g}^2/\text{Hz}$
 340 - 430 Hz @ +6 dB/oct
 430 - 1000 Hz @ $2.30 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $1.15 \text{ g}^2/\text{Hz}$

Composite = $59.0 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.37 \text{ g}^2/\text{Hz}$
 20 - 72 Hz @ +6 dB/oct
 72 - 300 Hz @ $4.5 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.7 \text{ g}^2/\text{Hz}$

Composite = $60.8 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.088 \text{ g}^2/\text{Hz}$
 20 - 88 Hz @ +6 dB/oct
 88 - 1000 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.75 \text{ g}^2/\text{Hz}$

Composite = $49.5 \text{ g}_{\text{rms}}$

1-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 1-1-C Input to Components Mounted on the ET LH₂ Aft
Bulkhead Gores. Weight of Component ≥ 25 but < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
20 - 70 Hz @ +9 dB/oct
70 - 300 Hz @ $0.78 \text{ g}^2/\text{Hz}$
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $25.2 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.018 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +6 dB/oct
65 - 340 Hz @ $0.18 \text{ g}^2/\text{Hz}$
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ $0.29 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.14 \text{ g}^2/\text{Hz}$

Composite = $20.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.076 \text{ g}^2/\text{Hz}$
20 - 70 Hz @ +9 dB/oct
70 - 300 Hz @ $3.10 \text{ g}^2/\text{Hz}$
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.47 \text{ g}^2/\text{Hz}$

Composite = $50.4 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.070 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +6 dB/oct
65 - 340 Hz @ $0.73 \text{ g}^2/\text{Hz}$
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ $1.15 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.58 \text{ g}^2/\text{Hz}$

Composite = $41.9 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.37 \text{ g}^2/\text{Hz}$
20 - 49 Hz @ +6 dB/oct
49 - 300 Hz @ $2.2 \text{ g}^2/\text{Hz}$
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.35 \text{ g}^2/\text{Hz}$

Composite = $42.9 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.088 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +6 dB/oct
60 - 1000 Hz @ $0.75 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.38 \text{ g}^2/\text{Hz}$

Composite = $35.2 \text{ g}_{\text{rms}}$

1-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 1-1-D Input to LH₂ External Feedline, LH₂ Recirculation Line
and LH₂ Internal Bellows at the Aft LH₂ Dome Gore.

1. Acceptance Tst Criteria (1 min/axis)

Direction A

20 Hz @ 0.045 g²/Hz
20 - 50 Hz @ +4 dB/oct
50 - 300 Hz @ 0.16 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.024 g²/Hz

Composite = 11.6 g_{rms}

Directions B and C

20 Hz @ 0.018 g²/Hz
20 - 29 Hz @ +6 dB/oct
29 - 340 Hz @ 0.038 g²/Hz
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ 0.058 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.03 g²/Hz

Composite = 9.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.076 g²/Hz
20 - 50 Hz @ +9 dB/oct
50 - 300 Hz @ 0.63 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.095 g²/Hz

Composite = 22.9 g_{rms}

Directions B and C

20 Hz @ 0.07 g²/Hz
20 - 29 Hz @ +6 dB/oct
29 - 340 Hz @ 0.15 g²/Hz
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ 0.23 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.12 g²/Hz

Composite = 19.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.2 g²/Hz
20 - 40 Hz @ +3 dB/oct
40 - 300 Hz @ 0.4 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.062 g²/Hz

Composite = 18.4 g_{rms}

Directions B and C

20 Hz @ 0.075 g²/Hz
20 - 40 Hz @ +3 dB/oct
40 - 1000 Hz @ 0.15 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.075 g²/Hz

Composite = 15.8 g_{rms}

1-1-D (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 1-2 ET LH₂ Aft Bulkhead Cap and Covers (General Specifications)

Same as Subzone 1-2-A below.

Subzone 1-2-A Input to Components Mounted on the ET LH₂ Aft Bulkhead Cap and Manhole Cover Plates. Weight of Component < 50 lbs.

1. Acceptance Test Criteria (1 min/axis)

20 Hz @ 0.0080 g ² /Hz	20 Hz @ 0.0072 g ² /Hz
20 - 110 Hz @ +9 dB/oct	20 - 130 Hz @ +6 dB/oct
110 - 300 Hz @ 1.30 g ² /Hz	130 - 340 Hz @ 0.30 g ² /Hz
300 - 2000 Hz @ -3 dB/oct	340 - 430 Hz @ +6 dB/oct
2000 Hz @ 0.20 g ² /Hz	430 - 1000 Hz @ 0.48 g ² /Hz
	1000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ 0.24 g ² /Hz

Composite = 32.0 g_{rms}

Composite = 26.6 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/ axis)

Direction A

20 Hz @ 0.032 g ² /Hz
20 - 110 Hz @ +9 dB/oct
110 - 300 Hz @ 5.20 g ² /Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.78 g ² /Hz

Composite = 64.0 g_{rms}

Directions B and C

20 Hz @ 0.029 g ² /Hz
20 - 130 Hz @ +6 dB/oct
130 - 340 Hz @ 1.20 g ² /Hz
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ 1.90 g ² /Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.95 g ² /Hz

Composite = 53.3 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.11 g ² /Hz
20 - 100 Hz @ +6 dB/oct
100 - 200 Hz @ 2.60 g ² /Hz
200 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.026 g ² /Hz

Composite = 28.6 g_{rms}

Directions B and C

20 Hz @ 0.035 g ² /Hz
20 - 90 Hz @ +6 dB/oct
90 - 150 Hz @ 0.71 g ² /Hz
150 - 260 Hz @ -9 dB/oct
260 - 1000 Hz @ 0.14 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.035 g ² /Hz

Composite = 16.5 g_{rms}

1-2-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A - Perpendicular to Bulkhead

Direction B - Tangential to Bulkhead

Direction C - Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 1-2-B Input to Components Mounted on the ET LH₂ Aft Bulk-head Cap and Manhole Cover Plates. Weight of Components ≥ 50 but < 150 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.0080 \text{ g}^2/\text{Hz}$
 20 - 88 Hz @ +9 dB/oct
 88 - 300 Hz @ $0.65 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.098 \text{ g}^2/\text{Hz}$

Composite = $22.6 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.0072 \text{ g}^2/\text{Hz}$
 20 - 92 Hz @ +6 dB/oct
 92 - 340 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 340 - 430 Hz @ +6 dB/oct
 430 - 1000 Hz @ $0.24 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $18.8 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.032 \text{ g}^2/\text{Hz}$
 20 - 88 Hz @ +9 dB/oct
 88 - 300 Hz @ $2.60 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.39 \text{ g}^2/\text{Hz}$

Composite = $45.2 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.029 \text{ g}^2/\text{Hz}$
 20 - 92 Hz @ +6 dB/oct
 92 - 340 Hz @ $0.60 \text{ g}^2/\text{Hz}$
 340 - 430 Hz @ +6 dB/oct
 430 - 1000 Hz @ $0.95 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.48 \text{ g}^2/\text{Hz}$

Composite = $37.7 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +6 dB/oct
 70 - 200 Hz @ $1.30 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$

Composite = $20.8 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.035 \text{ g}^2/\text{Hz}$
 20 - 64 Hz @ +6 dB/oct
 64 - 150 Hz @ $0.36 \text{ g}^2/\text{Hz}$
 150 - 260 Hz @ -9 dB/oct
 260 - 1000 Hz @ $0.070 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $12.0 \text{ g}_{\text{rms}}$

1-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

1-2-C Input to Components Mounted on the ET LH₂ Aft Bulkhead Cap and Manhole Cover Plates. Weight of Component ≥ 150 but < 300 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.0080 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +9 dB/oct
 70 - 300 Hz @ $0.32 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.050 \text{ g}^2/\text{Hz}$

Composite = $16.3 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.0072 \text{ g}^2/\text{Hz}$
 20 - 65 Hz @ +6 dB/oct
 65 - 340 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 340 - 430 Hz @ +6 dB/oct
 430 - 1000 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.060 \text{ g}^2/\text{Hz}$

Composite = $13.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.032 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +9 dB/oct
 70 - 300 Hz @ $1.30 \text{ g}^2/\text{Hz}$
 300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.20 \text{ g}^2/\text{Hz}$

Composite = $32.6 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.029 \text{ g}^2/\text{Hz}$
 20 - 65 Hz @ +6 dB/oct
 65 - 340 Hz @ $0.30 \text{ g}^2/\text{Hz}$
 340 - 430 Hz @ +6 dB/oct
 430 - 1000 Hz @ $0.48 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.24 \text{ g}^2/\text{Hz}$

Composite = $27.0 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 20 - 50 Hz @ +6 dB/oct
 50 - 200 Hz @ $0.65 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0066 \text{ g}^2/\text{Hz}$

Composite = $15.0 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.035 \text{ g}^2/\text{Hz}$
 20 - 45 Hz @ +6 dB/oct
 45 - 150 Hz @ $0.18 \text{ g}^2/\text{Hz}$
 150 - 260 Hz @ -9 dB/oct
 260 - 1000 Hz @ $0.035 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0088 \text{ g}^2/\text{Hz}$

Composite = $8.6 \text{ g}_{\text{rms}}$

1-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 1-2-D Input to the LH₂ Siphon on the ET LH₂ Aft Bulkhead
Cap. Component wt. = 320#.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz 0.0080 g²/Hz
20 - 56 Hz @ +9 dB/oct
56 - 300 Hz @ 0.18 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.027 g²/Hz

Composite = 12.0 g_{rms}

Directions B and C

20 Hz @ 0.0072 g²/Hz
20 - 48 Hz @ +6 dB/oct
48 - 340 Hz @ 0.040 g²/Hz
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ 0.065 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.032 g²/Hz

Composite = 10.0 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.032 g²/Hz
20 - 56 Hz @ +9 dB/oct
56 - 300 Hz @ 0.70 g²/Hz
300 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.11 g²/Hz

Composite = 24.1 g_{rms}

Directions B and C

20 Hz @ 0.029 g²/Hz
20 - 48 Hz @ +6 dB/oct
48 - 340 Hz @ 0.16 g²/Hz
340 - 430 Hz @ +6 dB/oct
430 - 1000 Hz @ 0.26 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.13 g²/Hz

Composite 20.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.11 g²/Hz
20 - 36 Hz @ +6 dB/oct
36 - 200 Hz @ 0.35 g²/Hz
200 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0036 g²/Hz

Composite = 11.1 g_{rms}

Directions B and C

20 Hz @ 0.035 g²/Hz
20 - 33 Hz @ +6 dB/oct
33 - 150 Hz @ 0.096 g²/Hz
150 - 260 Hz @ -9 dB/oct
260 - 1000 Hz @ 0.019 g²/Hz
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0048 g²/Hz

Composite = 6.4 g_{rms}

1-2-D (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction B — Tangential to Bulkhead, Perpendicular to Direction A

* Design Criteria Only

Zone 2 ET LH₂ Cylinder

Subzone 2-1 ET LH₂ Cylinder, Aft Section (Stations X_t 2058 to X_t 1624), Inboard Half (+Z Axis ±90°). (General Specifications)

Same as Subzone 2-1-1-A below.

Subzone 2-1-1 Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_t 2058 to X_t 1624), Inboard Half (+Z Axis ±90°). (General Specifications).

Same as Subzone 2-1-1-A below.

Subzone 2-1-1-A Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 to X_t 1624), Inboard Half (+Z ±90°), and not within ±10° of the GO₂ Press. Line/Cable Tray installation. Weight of component < 15 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.045 g²/Hz
20 - 30 Hz @ +6 dB/oct
30 - 56 Hz @ 0.10 g²/Hz
56 - 100 Hz @ +12 dB/oct
100 - 400 Hz @ 1.0 g²/Hz
400 - 2000 Hz @ -4 dB/oct
2000 Hz @ 0.12 g²/Hz

Composite = 28.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.011 g²/Hz
20 - 130 Hz @ +4 dB/oct
130 - 700 Hz @ 0.13 g²/Hz
700 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.045 g²/Hz

Composite = 13.1 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.067 g²/Hz
20 - 30 Hz @ +6 dB/oct
30 - 47 Hz @ 0.15 g²/Hz
47 - 90 Hz @ +12 dB/oct
90 - 400 Hz @ 2.0 g²/Hz
400 - 2000 Hz @ -4 dB/oct
2000 Hz @ 0.23 g²/Hz

Composite = 41.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00084 g²/Hz
20 - 100 Hz @ +9 dB/oct
100 - 400 Hz @ 0.10 g²/Hz
400 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.30 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.15 g²/Hz

Composite = 19.7 g_{rms}

2-1-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.18 \text{ g}^2/\text{Hz}$
30 - 30 Hz @ +6 dB/oct
30 - 56 Hz @ $0.4 \text{ g}^2/\text{Hz}$
56 - 100 Hz @ +12 dB/oct
100 - 400 Hz @ $4.0 \text{ g}^2/\text{Hz}$
400 - 2000 Hz @ - 4 dB/oct
2000 Hz @ $0.47 \text{ g}^2/\text{Hz}$

Composite = $57.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.042 \text{ g}^2/\text{Hz}$
20 - 130 Hz @ +4 dB/oct
130 - 700 Hz @ $0.5 \text{ g}^2/\text{Hz}$
700 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.18 \text{ g}^2/\text{Hz}$

Composite = $26.1 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-1-B Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 to X_T 1624), Inboard Half (+Z ±90°), and not within ±10° of the GO₂ Press. Line/Cable Tray installation. Weight of Component ≥ 15 but < 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.045 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 56 Hz @ 0.10 g²/Hz
 56 - 34 Hz @ +12 dB/oct
 84 - 400 Hz @ 0.50 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.058 g²/Hz

Composite = 20.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.011 g²/Hz
 20 - 78 Hz @ +4 dB/oct
 78 - 700 Hz @ 0.063 g²/Hz
 700 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.022 g²/Hz

Composite = 9.3 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.067 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 47 Hz @ 0.15 g²/Hz
 47 - 76 Hz @ +12 dB/oct
 76 - 400 Hz @ 1.0 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.12 g²/Hz

Composite = 28.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00084 g²/Hz
 20 - 78 Hz @ +9 dB/oct
 78 - 400 Hz @ 0.050 g²/Hz
 400 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ 0.15 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.075 g²/Hz

Composite = 14.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.18 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 56 Hz @ 0.4 g²/Hz
 56 - 84 Hz @ +12 dB/oct
 84 - 400 Hz @ 2.0 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.23 g²/Hz

Composite = 41.3 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.042 g²/Hz
 20 - 78 Hz @ +4 dB/oct
 78 - 700 Hz @ 0.25 g²/Hz
 700 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.086 g²/Hz

Composite = 18.6 g_{rms}

2-1-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-1-C Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 to X_T 1624), Inboard Half (+Z ±90°), and not within ±10° of the GO₂ Press. Line/Cable Tray installation. Weight of Component ≥ 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.045 g ² /Hz	20 - 20 Hz @ 0.011 g ² /Hz
30 - 30 Hz @ +6 dB/oct	44 - 44 Hz @ +4 dB/oct
56 - 56 Hz @ 0.10 g ² /Hz	700 - 700 Hz @ 0.03 g ² /Hz
71 - 71 Hz @ +12 dB/oct	2000 - 2000 Hz @ -3 dB/oct
400 - 400 Hz @ 0.25 g ² /Hz	2000 - 2000 Hz @ 0.011 g ² /Hz
2000 - 2000 Hz @ -4 dB/oct	
2000 - 2000 Hz @ 0.03 g ² /Hz	
Composite = 14.5 g _{rms}	Composite = 6.5 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.067 g ² /Hz	20 - 20 Hz @ 0.00084 g ² /Hz
30 - 30 Hz @ +6 dB/oct	62 - 62 Hz @ +9 dB/oct
47 - 47 Hz @ 0.15 g ² /Hz	400 - 400 Hz @ 0.025 g ² /Hz
64 - 64 Hz @ +12 dB/oct	700 - 700 Hz @ +6 dB/oct
400 - 400 Hz @ 0.5 g ² /Hz	1000 - 1000 Hz @ 0.075 g ² /Hz
2000 - 2000 Hz @ -4 dB/oct	2000 - 2000 Hz @ -3 dB/oct
2000 - 2000 Hz @ 0.06 g ² /Hz	2000 - 2000 Hz @ 0.038 g ² /Hz
Composite = 20.5 g _{rms}	Composite = 9.9 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.18 g ² /Hz	20 - 20 Hz @ 0.042 g ² /Hz
30 - 30 Hz @ +6 dB/oct	44 - 44 Hz @ +4 dB/oct
56 - 56 Hz @ 0.4 g ² /Hz	700 - 700 Hz @ 0.12 g ² /Hz
71 - 71 Hz @ +12 dB/oct	2000 - 2000 Hz @ -3 dB/oct
400 - 400 Hz @ 1.0 g ² /Hz	2000 - 2000 Hz @ 0.041 g ² /Hz
2000 - 2000 Hz @ -4 dB/oct	
2000 - 2000 Hz @ 0.12 g ² /Hz	
Composite = 28.9 g _{rms}	Composite = 13.0 g _{rms}

2-1-1-C (Cont'd)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-1-AP Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 - X_T 1624), Inboard Half (+Z = and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component < 15 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.045 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 56 Hz @ 0.10 g²/Hz
 56 - 100 Hz @ +12 dB/oct
 100 - 400 Hz @ 1.0 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.12 g²/Hz

Composite = 28.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0093 g²/Hz
 20 - 200 Hz @ +4 dB/oct
 200 - 250 Hz @ 0.2 g²/Hz
 250 - 400 Hz @ -3 dB/oct
 400 - 800 Hz @ 0.125 g²/Hz
 800 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.05 g²/Hz

Composite = 13.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.067 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 47 Hz @ 0.15 g²/Hz
 47 - 90 Hz @ +12 dB/oct
 90 - 400 Hz @ 2.0 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.23 g²/Hz

Composite = 41.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00084 g²/Hz
 20 - 100 Hz @ +9 dB/oct
 100 - 400 Hz @ 0.10 g²/Hz
 400 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ 0.30 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.15 g²/Hz

Composite = 19.7 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.18 g²/Hz
 20 - 30 Hz @ -6 dB/oct
 30 - 56 Hz @ 0.4 g²/Hz
 56 - 100 Hz @ +12 dB/oct
 100 - 400 Hz @ 4.0 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.47 g²/Hz

Composite = 57.3 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.037 g²/Hz
 20 - 200 Hz @ +4 dB/oct
 200 - 250 Hz @ 0.8 g²/Hz
 250 - 400 Hz @ -3 dB/oct
 400 - 800 Hz @ 0.5 g²/Hz
 800 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.2 g²/Hz

Composite = 27.7 g_{rms}

2-1-1-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-1-BP Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 to X_T 1624), Inboard Half (+Z ±90°) and within ±10° of the GO₂ Press. Line/Cable Tray installation. Weight of Component ≥ 15 but < 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.045 g ² /Hz	20 - 20 Hz @ 0.0093 g ² /Hz
30 - 30 Hz @ +6 dB/oct	84 - 84 Hz @ +4 dB/oct
56 - 56 Hz @ 0.10 g ² /Hz	140 - 140 Hz @ 0.063 g ² /Hz
84 - 84 Hz @ +12 dB/oct	200 - 200 Hz @ +4 dB/oct
200 - 400 Hz @ 0.50 g ² /Hz	250 - 250 Hz @ 0.1 g ² /Hz
400 - 2000 Hz @ -4 dB/oct	400 - 400 Hz @ -3 dB/oct
2000 Hz @ 0.058 g ² /Hz	800 - 800 Hz @ 0.063 g ² /Hz
	2000 Hz @ -3 dB/oct
	2000 Hz @ 0.025 g ² /Hz
Composite = 20.7 g _{rms}	Composite = 9.9 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.067 g ² /Hz	20 - 20 Hz @ 0.00084 g ² /Hz
30 - 30 Hz @ +6 dB/oct	78 - 78 Hz @ +9 dB/oct
47 - 47 Hz @ 0.15 g ² /Hz	400 - 400 Hz @ 0.050 g ² /Hz
76 - 76 Hz @ +12 dB/oct	700 - 700 Hz @ +6 dB/oct
400 - 400 Hz @ 1.0 g ² /Hz	1000 - 1000 Hz @ 0.15 g ² /Hz
2000 - 2000 Hz @ -4 dB/oct	2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.12 g ² /Hz	2000 Hz @ 0.075 g ² /Hz
Composite = 28.7 g _{rms}	Composite = 14.0 g _{rms}

2-1-1-BP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

	20 Hz @ $0.18 \text{ g}^2/\text{Hz}$
20 -	30 Hz @ +6 dB/oct
30 -	56 Hz @ $0.4 \text{ g}^2/\text{Hz}$
56 -	84 Hz @ +12 dB/oct
84 -	400 Hz @ $2.0 \text{ g}^2/\text{Hz}$
400 -	2000 Hz @ -4 dB/oct
	2000 Hz @ $0.23 \text{ g}^2/\text{Hz}$

Composite = $41.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

	20 Hz @ $0.037 \text{ g}^2/\text{Hz}$
20 -	84 Hz @ +4 dB/oct
84 -	140 Hz @ $0.25 \text{ g}^2/\text{Hz}$
140 -	200 Hz @ +4 dB/oct
200 -	250 Hz @ $0.4 \text{ g}^2/\text{Hz}$
250 -	400 Hz @ -3 dB/oct
400 -	800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
800 -	2000 Hz @ -3 dB/oct
	2000 Hz @ $0.1 \text{ g}^2/\text{Hz}$

Composite = $19.8 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 -	5 Hz @ 0.6 G's peak*
5 -	40 Hz @ 0.6 G's peak

Lateral Axes

2 -	5 Hz @ 0.8 G's peak*
5 -	40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-1-CP Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 to X_T 1624), Inboard Half (+Z ±90°), and within ±10° of the GO₂ Press. Line/Cable Tray Installation.
 Weight of Component ≥ 45 lb. but < 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.045 g ² /Hz	20 - 20 Hz @ 0.0093 g ² /Hz
30 - 30 Hz @ +6 dB/oct	48 - 48 Hz @ +4 dB/oct
30 - 56 Hz @ 0.10 g ² /Hz	48 - 140 Hz @ 0.03 g ² /Hz
56 - 71 Hz @ +12 dB/oct	140 - 200 Hz @ +4 dB/oct
71 - 400 Hz @ 0.25 g ² /Hz	200 - 250 Hz @ 0.05 g ² /Hz
400 - 2000 Hz @ -4 dB/oct	250 - 400 Hz @ -3 dB/oct
2000 Hz @ 0.03 g ² /Hz	400 - 800 Hz @ 0.03 g ² /Hz
	800 - 2000 Hz @ -3 dB/oct
	2000 Hz @ 0.011 g ² /Hz
Composite = 14.5 g _{rms}	Composite = 7.0 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.067 g ² /Hz	20 - 20 Hz @ 0.00084 g ² /Hz
30 - 30 Hz @ +6 dB/oct	62 - 62 Hz @ +9 dB/oct
30 - 47 Hz @ 0.15 g ² /Hz	62 - 400 Hz @ 0.025 g ² /Hz
47 - 64 Hz @ +12 dB/oct	400 - 700 Hz @ +6 dB/oct
64 - 400 Hz @ 0.5 g ² /Hz	700 - 1000 Hz @ 0.075 g ² /Hz
400 - 2000 Hz @ -4 dB/oct	1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.06 g ² /Hz	2000 Hz @ 0.038 g ² /Hz
Composite = 20.5 g _{rms}	Composite = 9.9 g _{rms}

2-1-1-CP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.18 \text{ g}^2/\text{Hz}$
 30 - 30 Hz @ +6 dB/oct
 30 - 56 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 56 - 71 Hz @ +12 dB/oct
 71 - 400 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $28.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.037 \text{ g}^2/\text{Hz}$
 48 - 48 Hz @ +4 dB/oct
 48 - 140 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 140 - 200 Hz @ +4 dB/oct
 200 - 250 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 250 - 400 Hz @ -3 dB/oct
 400 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.044 \text{ g}^2/\text{Hz}$

Composite = $13.9 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-1-DP Input to Components mounted on baffles and stiffened skin on the LH₂ Cylinder, Aft Section (X_T 2058 to X_T 1624), Inboard Half (+Z ±90°) and within ±10° of the GO₂ Press. Line/Cable Tray Installation Weight of Component ≥ 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.045 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 56 Hz @ 0.10 g²/Hz
 56 - 59 Hz @ +12 dB/oct
 59 - 400 Hz @ 0.13 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.015 g²/Hz

Composite = 10.5 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0093 g²/Hz
 20 - 29 Hz @ +4 dB/oct
 29 - 140 Hz @ 0.015 g²/Hz
 140 - 200 Hz @ +4 dB/oct
 200 - 250 Hz @ 0.025 g²/Hz
 250 - 400 Hz @ -3 dB/oct
 400 - 800 Hz @ 0.015 g²/Hz
 800 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.0055 g²/Hz

Composite = 4.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.067 g²/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 47 Hz @ 0.15 g²/Hz
 47 - 54 Hz @ +12 dB/oct
 54 - 400 Hz @ 0.25 g²/Hz
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.03 g²/Hz

Composite = 14.6 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00084 g²/Hz
 20 - 50 Hz @ +9 dB/oct
 50 - 400 Hz @ 0.013 g²/Hz
 400 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ 0.038 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.019 g²/Hz

Composite = 7.0 g_{rms}

2-1-1-DP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.18 \text{ g}^2/\text{Hz}$
 30 - 30 Hz @ +6 dB/oct
 30 - 56 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 56 - 59 Hz @ +12 dB/oct
 59 - 400 Hz @ $0.50 \text{ g}^2/\text{Hz}$
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ $0.058 \text{ g}^2/\text{Hz}$

Composite = $21.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.37 \text{ g}^2/\text{Hz}$
 29 - 29 Hz @ +4 dB/oct
 29 - 140 Hz @ $0.06 \text{ g}^2/\text{Hz}$
 140 - 200 Hz @ +4 dB/oct
 200 - 250 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 250 - 400 Hz @ -3 dB/oct
 400 - 800 Hz @ $0.06 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.022 \text{ g}^2/\text{Hz}$

Composite = $9.8 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-2 Structural Ring at Station X_T 1871 in the ET LH_2 Cylinder, Inboard Half (+Z Axis $\pm 90^\circ$). (General Specifications).

Same as Subzone 2-1-2-A below.

Subzone 2-1-2-A Input to Components mounted on the Structural Ring X_T 1871, Inboard side (+Z $\pm 90^\circ$), and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation.
Weight of Component < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.014 \text{ g}^2/\text{Hz}$	20 Hz @ $0.025 \text{ g}^2/\text{Hz}$
20 - 90 Hz @ +4 dB/oct	20 - 200 Hz @ +2 dB/oct
90 - 800 Hz @ $0.1 \text{ g}^2/\text{Hz}$	200 - 1700 Hz @ $0.11 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct	1700 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.08 \text{ g}^2/\text{Hz}$
Composite = $11 \text{ g}_{\text{rms}}$	Composite = $14.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.023 \text{ g}^2/\text{Hz}$	20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
20 - 120 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
120 - 1100 Hz @ $0.25 \text{ g}^2/\text{Hz}$	1100 - 1500 Hz @ $0.55 \text{ g}^2/\text{Hz}$
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.076 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.23 \text{ g}^2/\text{Hz}$
Composite = $19.5 \text{ g}_{\text{rms}}$	Composite = $27.6 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.056 \text{ g}^2/\text{Hz}$	20 Hz @ $0.1 \text{ g}^2/\text{Hz}$
20 - 90 Hz @ +4 dB/oct	20 - 200 Hz @ +2 dB/oct
90 - 800 Hz @ $0.4 \text{ g}^2/\text{Hz}$	200 - 1700 Hz @ $0.45 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct	1700 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.07 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.32 \text{ g}^2/\text{Hz}$
Composite = $21.9 \text{ g}_{\text{rms}}$	Composite = $29.2 \text{ g}_{\text{rms}}$

2-1-2-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-2-B Input to Components mounted on the Structural Ring
X_T 1871, Inboard side (+Z $\pm 90^\circ$), and not within $\pm 10^\circ$
of the GO₂ Press. Line/Cable Tray Installation.
 Weight of Component ≥ 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.014 \text{ g}^2/\text{Hz}$
 20 - 54 Hz @ +4 dB/oct
 54 - 800 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0088 \text{ g}^2/\text{Hz}$

Composite = $7.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.016 \text{ g}^2/\text{Hz}$
 20 - 140 Hz @ +2 dB/oct
 140 - 1700 Hz @ $0.055 \text{ g}^2/\text{Hz}$
 1700 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.04 \text{ g}^2/\text{Hz}$

Composite = $10.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +4 dB/oct
 100 - 1100 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 1100 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.039 \text{ g}^2/\text{Hz}$

Composite = $14.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 20 - 1100 Hz @ +2 dB/oct
 1100 - 1500 Hz @ $0.28 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $19.7 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.056 \text{ g}^2/\text{Hz}$
 20 - 54 Hz @ +4 dB/oct
 54 - 800 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.035 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.064 \text{ g}^2/\text{Hz}$
 20 - 140 Hz @ +2 dB/oct
 140 - 1700 Hz @ $0.22 \text{ g}^2/\text{Hz}$
 1700 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.16 \text{ g}^2/\text{Hz}$

Composite = $20.4 \text{ g}_{\text{rms}}$

2-1-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-2-AP Input to components mounted on the structural ring
(X_T 1871), Inboard side (+Z ±90°) and within ±10° of
the GO₂ Press. Line/Cable Tray Installation. Weight
of Component < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.014 g²/Hz
20 - 180 Hz @ +4 dB/oct
180 - 300 Hz @ 0.23 g²/Hz
300 - 350 Hz @ -12 dB/oct
350 - 1000 Hz @ 0.13 g²/Hz
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.033 g²/Hz

Composite = 13.9 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.033 g²/Hz
20 - 300 Hz @ +2 dB/oct
300 - 1000 Hz @ 0.2 g²/Hz
1000 - 2000 Hz @ -2 dB/oct
2000 Hz @ 0.13 g²/Hz

Composite = 18.1 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.023 g²/Hz
20 - 120 Hz @ +4 dB/oct
120 - 1100 Hz @ 0.25 g²/Hz
1100 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.076 g²/Hz

Composite = 19.5 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.038 g²/Hz
20 - 1100 Hz @ +2 dB/oct
1100 - 1500 Hz @ 0.55 g²/Hz
1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.23 g²/Hz

Composite = 27.6 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.054 g²/Hz
20 - 180 Hz @ +4 dB/oct
180 - 300 Hz @ 0.9 g²/Hz
300 - 350 Hz @ -12 dB/oct
350 - 1000 Hz @ 0.5 g²/Hz
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.13 g²/Hz

Composite = 27.8 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.13 g²/Hz
20 - 300 Hz @ +2 dB/oct
300 - 1000 Hz @ 0.8 g²/Hz
1000 - 2000 Hz @ -2 dB/oct
2000 Hz @ 0.5 g²/Hz

Composite = 36.1 g_{rms}

2-1-2-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axis

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-2 BP Input to components mounted on the structural ring
 (X_T 1871), Inboard side (+Z $\pm 90^\circ$) and within $\pm 10^\circ$
 of the GO₂ Press. Line/Cable Tray Installation.
 Weight of Component ≥ 75 lb. but < 225 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.01 \text{ g}^2/\text{Hz}$
 20 - 130 Hz @ +4 dB/oct
 130 - 300 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 300 - 350 Hz @ -12 dB/oct
 350 - 1000 Hz @ $0.06 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.016 \text{ g}^2/\text{Hz}$

Composite = $10.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.022 \text{ g}^2/\text{Hz}$
 20 - 210 Hz @ +2 dB/oct
 210 - 1000 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -2 dB/oct
 2000 Hz @ $0.033 \text{ g}^2/\text{Hz}$

Composite = $12.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +4 dB/oct
 100 - 1100 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 1100 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.039 \text{ g}^2/\text{Hz}$

Composite = $14.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 20 - 1100 Hz @ +2 dB/oct
 1100 - 1500 Hz @ $0.28 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $19.7 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.041 \text{ g}^2/\text{Hz}$
 20 - 130 Hz @ +4 dB/oct
 130 - 300 Hz @ $0.45 \text{ g}^2/\text{Hz}$
 300 - 350 Hz @ -12 dB/oct
 350 - 1000 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.063 \text{ g}^2/\text{Hz}$

Composite = $20.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.088 \text{ g}^2/\text{Hz}$
 20 - 210 Hz @ +2 dB/oct
 210 - 1000 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -2 dB/oct
 2000 Hz @ $0.13 \text{ g}^2/\text{Hz}$

Composite = $25.8 \text{ g}_{\text{rms}}$

2-1-2-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-2-CP Input to components mounted on the structural Ring
 (X_T 1871), Inboard side (+Z $\pm 90^\circ$) and within $\pm 10^\circ$
 of the GO₂ Press. Line/Cable Tray Installation.
 Weight of Component ≥ 225 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.008 g ² /Hz	20 Hz @ 0.014 g ² /Hz
20 - 90 Hz @ +4 dB/oct	20 - 150 Hz @ +2 dB/oct
90 - 300 Hz @ 0.055 g ² /Hz	150 - 1000 Hz @ 0.05 g ² /Hz
300 - 350 Hz @ -12 dB/oct	1000 - 2000 Hz @ -2 dB/oct
350 - 1000 Hz @ 0.03 g ² /Hz	2000 Hz @ 0.033 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	
2000 Hz @ 0.0075 g ² /Hz	
Composite = 7.1 g _{rms}	Composite = 9.6 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.023 g ² /Hz	20 Hz @ 0.016 g ² /Hz
20 - 80 Hz @ +4 dB/oct	20 - 550 Hz @ +2 dB/oct
80 - 1100 Hz @ 0.065 g ² /Hz	550 - 1500 Hz @ 0.14 g ² /Hz
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.019 g ² /Hz	2000 Hz @ 0.060 g ² /Hz
Composit = 10.1 g _{rms}	Composite = 15.0 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.031 g ² /Hz	20 Hz @ 0.054 g ² /Hz
20 - 90 Hz @ +4 dB/oct	20 - 150 Hz @ +2 dB/oct
90 - 300 Hz @ 0.22 g ² /Hz	150 - 1000 Hz @ 0.2 g ² /Hz
300 - 350 Hz @ -12 dB/oct	1000 - 2000 Hz @ -2 dB/oct
350 - 1000 Hz @ 0.12 g ² /Hz	2000 Hz @ 0.13 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	
2000 Hz @ 0.030 g ² /Hz	
Composite = 14.2 g _{rms}	Composite = 19.2 g _{rms}

2-1-2-CP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-3 Structural Ring at Station X_T 2058 in the ET LH_2 Cylinder, Inboard Half (+Z Axis $\pm 90^\circ$). (General Specifications)

Same as Subzone 2-1-3-A below.

Subzone 2-1-3-A Input to components mounted on the structural Ring at X_T 2058, Inboard side (+Z $\pm 90^\circ$) and not within $\pm 10^\circ$ of GO_2 Press. Line/Cable Tray Installation.
Weight of Component < 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
20 - 90 Hz @ +4 dB/oct
90 - 170 Hz @ $0.075 \text{ g}^2/\text{Hz}$
170 - 340 Hz @ -3 dB/oct
340 - 1000 Hz @ $0.038 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -4 dB/oct
2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $8.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.014 \text{ g}^2/\text{Hz}$
20 - 200 Hz @ +2 dB/oct
200 - 1300 Hz @ $0.055 \text{ g}^2/\text{Hz}$
1300 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.035 \text{ g}^2/\text{Hz}$

Composite = $9.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.012 \text{ g}^2/\text{Hz}$
20 - 120 Hz @ +4 dB/oct
120 - 1100 Hz @ $0.13 \text{ g}^2/\text{Hz}$
1100 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.039 \text{ g}^2/\text{Hz}$

Composite = $14.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
20 - 1100 Hz @ +2 dB/oct
1100 - 1500 Hz @ $0.27 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.11 \text{ g}^2/\text{Hz}$

Composite = $19.4 \text{ g}_{\text{rms}}$

2-1-3-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.044 \text{ g}^2/\text{Hz}$
90 Hz @ +4 dB/oct
90 - 170 Hz @ $0.3 \text{ g}^2/\text{Hz}$
170 - 340 Hz @ -3 dB/oct
340 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -4 dB/oct
2000 Hz @ $0.06 \text{ g}^2/\text{Hz}$

Composite = $16.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.054 \text{ g}^2/\text{Hz}$
20 - 200 Hz @ +2 dB/oct
200 - 1300 Hz @ $0.22 \text{ g}^2/\text{Hz}$
1300 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.14 \text{ g}^2/\text{Hz}$

Composite = $19.8 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-3-B Input to components mounted on the structural Ring at X_T 2058, Inboard side (+Z ±90°) and not within ±10° of GO₂ Press. Line/Cable Tray Installation.
 Weight of Component \geq 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0083 g²/Hz
 20 - 65 Hz @ +4 dB/oct
 65 - 170 Hz @ 0.038 g²/Hz
 170 - 340 Hz @ -3 dB/oct
 340 - 1000 Hz @ 0.019 g²/Hz
 1000 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.0075 g²/Hz

Composite = 5.8 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0085 g²/Hz
 20 - 140 Hz @ +2 dB/oct
 140 - 1300 Hz @ 0.028 g²/Hz
 1300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.018 g²/Hz

Composite = 7.1 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0077 g²/Hz
 20 - 100 Hz @ +4 dB/oct
 100 - 1100 Hz @ 0.065 g²/Hz
 1100 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.020 g²/Hz

Composite = 10.0 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0098 g²/Hz
 20 - 1100 Hz @ +2 dB/oct
 1100 - 1500 Hz @ 0.14 g²/Hz
 1500 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.059 g²/Hz

Composite = 13.9 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.033 g²/Hz
 20 - 65 Hz @ +4 dB/oct
 65 - 170 Hz @ 0.15 g²/Hz
 170 - 340 Hz @ -3 dB/oct
 340 - 1000 Hz @ 0.075 g²/Hz
 1000 - 2000 Hz @ -4 dB/oct
 2000 Hz @ 0.03 g²/Hz

Composite = 11.5 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.034 g²/Hz
 20 - 140 Hz @ +2 dB/oct
 140 - 1300 Hz @ 0.11 g²/Hz
 1300 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.072 g²/Hz

Composite = 14.1 g_{rms}

2-1-3-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-3-AP Input to Components mounted on the Structural Ring at X_T 2058, Inboard side (+Z ±90°), and within ±10° of the GO₂ Press. Line/Cable Tray Installation.
Weight of Component < 100 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0088 g²/Hz
20 - 150 Hz @ +4 dB/oct
150 - 200 Hz @ 0.13 g²/Hz
200 - 500 Hz @ -3 dB/oct
500 - 1000 Hz @ 0.05 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.025 g²/Hz

Composite = 8.9 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.016 g²/Hz
20 - 300 Hz @ +2 dB/oct
300 - 1000 Hz @ 0.1 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.05 g²/Hz

Composite = 12.6 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.012 g²/Hz
20 - 120 Hz @ +4 dB/oct
120 - 1100 Hz @ 0.13 g²/Hz
1100 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.039 g²/Hz

Composite = 14.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.019 g²/Hz
20 - 1100 Hz @ +2 dB/oct
1100 - 1500 Hz @ 0.27 g²/Hz
1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.11 g²/Hz

Composite = 19.4 g_{rms}

3. Boost Random Vibrations Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.035 g²/Hz
20 - 150 Hz @ +4 dB/oct
150 - 200 Hz @ 0.5 g²/Hz
200 - 500 Hz @ -3 dB/oct
500 - 1000 Hz @ 0.2 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.1 g²/Hz

Composite = 17.8 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.064 g²/Hz
20 - 300 Hz @ +2 dB/oct
300 - 1000 Hz @ 0.4 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.2 g²/Hz

Composite = 25.1 g_{rms}

2-1-3-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-1-3-BP Input to Components mounted on the structural Ring at \bar{X}_T 2058, Inboard side (+Z $\pm 90^\circ$), and within $\pm 10^\circ$ of the GO₂ Press. Line/Cable Tray Installation. Weight of Component \geq 100 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0068 g²/Hz
 20 - 110 Hz @ +4 dB/oct
 110 - 200 Hz @ 0.063 g²/Hz
 200 - 500 Hz @ -3 dB/oct
 500 - 1000 Hz @ 0.024 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.012 g²/Hz

Composite = 6.4 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.01 g²/Hz
 20 - 210 Hz @ +2 dB/oct
 210 - 1000 Hz @ 0.05 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.025 g²/Hz

Composite = 9.0 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0077 g²/Hz
 20 - 100 Hz @ +4 dB/oct
 100 - 1100 Hz @ 0.065 g²/Hz
 1100 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.020 g²/Hz

Composite = 10.0 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0098 g²/Hz
 20 - 1100 Hz @ +2 dB/oct
 1100 - 1500 Hz @ 0.14 g²/Hz
 1500 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.059 g²/Hz

Composite = 13.9 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.027 g²/Hz
 20 - 110 Hz @ +4 dB/oct
 110 - 200 Hz @ 0.25 g²/Hz
 200 - 500 Hz @ -3 dB/oct
 500 - 1000 Hz @ 0.096 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.048 g²/Hz

Composite = 12.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.041 g²/Hz
 20 - 210 Hz @ +2 dB/oct
 210 - 1000 Hz @ 0.2 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.1 g²/Hz

Composite = 17.9 g_{rms}

2-1-3-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-2 ET LH₂ Cylinder, Aft Section (Stations X_T 2058 to X_T 1624), Outboard Half (-Z Axis ±90°). (General Specifications).

Same as Subzone 2-2-1-A below.

Subzone 2-2-1 Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 2058 to X_T 1624), Outboard Half (-Z Axis ±90°). (General Specifications)

Same as Subzone 2-2-1-A below.

Subzone 2-2-1-A Input to Components Mounted on Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 2058 to X_T 1624), Outboard Half (-Z Axis ±90°).
Weight of Component < 15 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.017 g²/Hz
20 - 30 Hz @ +6 dB/oct
30 - 47 Hz @ 0.038 g²/Hz
47 - 90 Hz @ +12 dB/oct
90 - 400 Hz @ 0.5 g²/Hz
400 - 2000 Hz @ -4 dB/oct
2000 Hz @ 0.058 g²/Hz

Composite = 20.6 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00021 g²/Hz
20 - 100 Hz @ +9 dB/oct
100 - 400 Hz @ 0.025 g²/Hz
400 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.075 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.038 g²/Hz

Composite = 9.8 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.067 g²/Hz
20 - 30 Hz @ +6 dB/oct
30 - 47 Hz @ 0.15 g²/Hz
47 - 90 Hz @ +12 dB/oct
90 - 400 Hz @ 2.0 g²/Hz
400 - 2000 Hz @ -4 dB/oct
2000 Hz @ 0.23 g²/Hz

Composite = 41.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00084 g²/Hz
20 - 100 Hz @ +9 dB/oct
100 - 400 Hz @ 0.10 g²/Hz
400 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.30 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.15 g²/Hz

Composite = 19.7 g_{rms}

2-2-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.050 \text{ g}^2/\text{Hz}$
20 - 70 Hz @ +6 dB/oct
70 - 1000 Hz @ $0.60 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $28.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0014 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 1000 Hz @ $0.035 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $7.5 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-2-1-B Input to Components Mounted on Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 2058 to X_T 1624), Outboard Half (-Z Axis $\pm 90^\circ$).
 Weight of Component ≥ 15 but < 45 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.017 \text{ g}^2/\text{Hz}$
 30 - 30 Hz @ +6 dB/oct
 30 - 47 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 47 - 76 Hz @ +12 dB/oct
 76 - 400 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ $0.030 \text{ g}^2/\text{Hz}$

Composite = $14.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.00021 \text{ g}^2/\text{Hz}$
 78 - 78 Hz @ +9 dB/oct
 78 - 400 Hz @ $0.012 \text{ g}^2/\text{Hz}$
 400 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.037 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $7.0 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.067 \text{ g}^2/\text{Hz}$
 30 - 30 Hz @ +6 dB/oct
 30 - 47 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 47 - 76 Hz @ +12 dB/oct
 76 - 400 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 400 - 2000 Hz @ -4 dB/oct
 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $28.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.00084 \text{ g}^2/\text{Hz}$
 78 - 78 Hz @ +9 dB/oct
 78 - 400 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 400 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $14.0 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 50 - 50 Hz @ +6 dB/oct
 50 - 1000 Hz @ $0.30 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.038 \text{ g}^2/\text{Hz}$

Composite = $20.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0014 \text{ g}^2/\text{Hz}$
 72 - 72 Hz @ +6 dB/oct
 72 - 1000 Hz @ $0.018 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.009 \text{ g}^2/\text{Hz}$

Composite = $5.4 \text{ g}_{\text{rms}}$

2-2-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-2-1-C Input to Components Mounted on Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 2058 to X_T 1624), Outboard Half (-Z Axis $\pm 90^\circ$).
Weight of Component \geq 45 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.017 g²/Hz
20 - 30 Hz @ +6 dB/oct
30 - 47 Hz @ 0.038 g²/Hz
47 - 64 Hz @ +12 dB/oct
64 - 400 Hz @ 0.13 g²/Hz
400 - 2000 Hz @ -4 dB/oct
2000 Hz @ 0.015 g²/Hz

Composite = 5.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00021 g²/Hz
20 - 62 Hz @ +9 dB/oct
62 - 400 Hz @ 0.0062 g²/Hz
400 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.019 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.0095 g²/Hz

Composite = 4.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.067 g²/Hz
20 - 30 Hz @ +6 dB/oct
30 - 47 Hz @ 0.15 g²/Hz
47 - 64 Hz @ +12 dB/oct
64 - 400 Hz @ 0.5 g²/Hz
400 - 2000 Hz @ -4 dB/oct
2000 Hz @ 0.06 g²/Hz

Composite = 20.5 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00084 g²/Hz
20 - 62 Hz @ +9 dB/oct
62 - 400 Hz @ 0.025 g²/Hz
400 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.075 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.038 g²/Hz

Composite = 9.9 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.024 g²/Hz
20 - 50 Hz @ +6 dB/oct
50 - 1000 Hz @ 0.15 g²/Hz
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.019 g²/Hz

Composite = 14.2 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0014 g²/Hz
20 - 72 Hz @ +6 dB/oct
72 - 1000 Hz @ 0.015 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.0076 g²/Hz

Composite = 5.0 g_{rms}

2-2-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

Lateral Axes

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-2-2 Structural Ring at Station X_T 1871 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). (General Specifications)

Same as Subzone 2-2-2-A below.

Subzone 2-2-2-A Input to Components Mounted on the Structural Ring at Station X_T 1871 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of Component < 60 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0075 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +4 dB/oct
 120 - 1100 Hz @ $0.080 \text{ g}^2/\text{Hz}$
 1100 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $11.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.012 \text{ g}^2/\text{Hz}$
 20 - 1100 Hz @ +2 dB/oct
 1100 - 1500 Hz @ $0.17 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.030 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +4 dB/oct
 120 - 1100 Hz @ $0.32 \text{ g}^2/\text{Hz}$
 1100 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.097 \text{ g}^2/\text{Hz}$

Composite = $22.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.049 \text{ g}^2/\text{Hz}$
 20 - 1100 Hz @ +2 dB/oct
 1100 - 1500 Hz @ $0.70 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.30 \text{ g}^2/\text{Hz}$

Composite = $31.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.017 \text{ g}^2/\text{Hz}$
 20 - 80 Hz @ +4 dB/oct
 80 - 200 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 200 - 300 Hz @ -10 dB/oct
 300 - 1500 Hz @ $0.030 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.017 \text{ g}^2/\text{Hz}$

Composite = $8.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 600 Hz @ $0.045 \text{ g}^2/\text{Hz}$
 600 - 1000 Hz @ +3 dB/oct
 1000 - 1500 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.042 \text{ g}^2/\text{Hz}$

Composite = $10.7 \text{ g}_{\text{rms}}$

2-2-2-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-2-2-B Input to Components Mounted on the Structural Ring
at Station X_T 1871 in the ET LH_2 Cylinder, Outboard
Half (-Z Axis $\pm 90^\circ$). Weight of Component ≥ 60 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0047 \text{ g}^2/\text{Hz}$	20 Hz @ $0.0060 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
100 - 1100 Hz @ $0.040 \text{ g}^2/\text{Hz}$	1100 - 1500 Hz @ $0.087 \text{ g}^2/\text{Hz}$
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.037 \text{ g}^2/\text{Hz}$
Composite = $7.8 \text{ g}_{\text{rms}}$	Composite = $11.0 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.019 \text{ g}^2/\text{Hz}$	20 Hz @ $0.024 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
100 - 1100 Hz @ $0.16 \text{ g}^2/\text{Hz}$	1100 - 1500 Hz @ $0.35 \text{ g}^2/\text{Hz}$
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.049 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
Composite = $15.7 \text{ g}_{\text{rms}}$	Composite = $22.0 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0087 \text{ g}^2/\text{Hz}$	20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
20 - 80 Hz @ +4 dB/oct	20 - 40 Hz @ +3 dB/oct
80 - 200 Hz @ $0.055 \text{ g}^2/\text{Hz}$	40 - 600 Hz @ $0.022 \text{ g}^2/\text{Hz}$
200 - 300 Hz @ -10 dB/oct	600 - 1000 Hz @ +3 dB/oct
300 - 1500 Hz @ $0.015 \text{ g}^2/\text{Hz}$	1000 - 1500 Hz @ $0.037 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0085 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.021 \text{ g}^2/\text{Hz}$
Composite = $5.9 \text{ g}_{\text{rms}}$	Composite = $7.5 \text{ g}_{\text{rms}}$

2-2-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-2-3 Structural Ring at Station X_T 2058 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). (General Specifications)

Same as Subzone 2-2-3-A below.

Subzone 2-2-3-A Input to Components Mounted on the Structural Ring at Station X_T 2058 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of Component < 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.0030 g^2/Hz	20 Hz @ 0.0048 g^2/Hz
20 - 120 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
120 - 1100 Hz @ 0.032 g^2/Hz	1100 - 1500 Hz @ 0.068 g^2/Hz
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.098 g^2/Hz	2000 Hz @ 0.038 g^2/Hz
Composite = 7.0 g_{rms}	Composite = 9.7 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.012 g^2/Hz	20 Hz @ 0.019 g^2/Hz
20 - 120 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
120 - 1100 Hz @ 0.13 g^2/Hz	1100 - 1500 Hz @ 0.27 g^2/Hz
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.039 g^2/Hz	2000 Hz @ 0.11 g^2/Hz
Composite = 14.1 g_{rms}	Composite = 19.4 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.0073 g^2/Hz	20 Hz @ 0.0093 g^2/Hz
20 - 80 Hz @ +4 dB/oct	20 - 40 Hz @ +3 dB/oct
80 - 200 Hz @ 0.046 g^2/Hz	40 - 600 Hz @ 0.018 g^2/Hz
200 - 300 Hz @ -10 dB/oct	600 - 1000 Hz @ +3 dB/oct
300 - 1500 Hz @ 0.012 g^2/Hz	1000 - 1500 Hz @ 0.030 g^2/Hz
1500 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0068 g^2/Hz	2000 Hz @ 0.017 g^2/Hz
Composite = 5.3 g_{rms}	Composite = 6.8 g_{rms}

2-2-3-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 2-2-3-B Input to Components Mounted on the Structural Ring
at Station X_T 2058 in the ET LH₂ Cylinder, Outboard
Half (-Z Axis ±90°). Weight of Component ≥ 60 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.0019 g ² /Hz	20 Hz @ 0.0025 g ² /Hz
20 - 100 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
100 - 1100 Hz @ 0.016 g ² /Hz	1100 - 1500 Hz @ 0.035 g ² /Hz
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.0050 g ² /Hz	2000 Hz @ 0.015 g ² /Hz
Composite = 5.0 g _{rms}	Composite = 6.9 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.0077 g ² /Hz	20 Hz @ 0.0098 g ² /Hz
20 - 100 Hz @ +4 dB/oct	20 - 1100 Hz @ +2 dB/oct
100 - 1100 Hz @ 0.065 g ² /Hz	1100 - 1500 Hz @ 0.14 g ² /Hz
1100 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.020 g ² /Hz	2000 Hz @ 0.059 g ² /Hz
Composite = 10.0 g _{rms}	Composite = 13.9 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.0066 g ² /Hz	20 Hz @ 0.0049 g ² /Hz
20 - 80 Hz @ +4 dB/oct	20 - 40 Hz @ +3 dB/oct
80 - 200 Hz @ 0.041 g ² /Hz	40 - 600 Hz @ 0.0098 g ² /Hz
200 - 300 Hz @ -10 dB/oct	600 - 1000 Hz @ +3 dB/oct
300 - 1500 Hz @ 0.011 g ² /Hz	1000 - 1500 Hz @ 0.016 g ² /Hz
1500 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0061 g ² /Hz	2000 Hz @ 0.0092 g ² /Hz
Composite = 5.0 g _{rms}	Composite = 5.0 g _{rms}

2-2-3-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 2-3 ET LH₂ Cylinder, Forward Section (Stations X_T 1624 to X_T 1123), Inboard Half (+Z Axis ±90°). (General Specifications)

Same as Subzone 2-3-1-A below.

Subzone 2-3-1-A Input to components mounted on Baffles and Stiffened Skin on the LH₂ Tank, Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and not within ±10° of the GO₂ Press. Line/Cable Tray Installation.
Weight of Component < 15 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0063 g²/Hz
20 - 120 Hz @ +9 dB/oct
120 - 160 Hz @ 1.3 g²/Hz
160 - 280 Hz @ -6 dB/oct
280 - 900 Hz @ 0.43 g²/Hz
900 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.09 g²/Hz

Composite = 25.2 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00033 g²/Hz
20 - 90 Hz @ +9 dB/oct
90 - 220 Hz @ 0.025 g²/Hz
220 - 270 Hz @ +9 dB/oct
270 - 1000 Hz @ 0.045 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.023 g²/Hz

Composite = 8.4 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.042 g²/Hz
20 - 75 Hz @ +6 dB/oct
75 - 170 Hz @ 0.56 g²/Hz
170 - 240 Hz @ +6 dB/oct
240 - 900 Hz @ 1.13 g²/Hz
900 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.51 g²/Hz

Composite = 41.0 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00039 g²/Hz
20 - 100 Hz @ +9 dB/oct
100 - 440 Hz @ 0.048 g²/Hz
440 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.12 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.061 g²/Hz

Composite = 12.6 g_{rms}

2-3-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +9 dB/oct
 120 - 160 Hz @ $5.0 \text{ g}^2/\text{Hz}$
 160 - 280 Hz @ -6 dB/oct
 280 - 900 Hz @ $1.7 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.36 \text{ g}^2/\text{Hz}$

Composite = $50.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0013 \text{ g}^2/\text{Hz}$
 20 - 90 Hz @ +9 dB/oct
 90 - 220 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 220 - 270 Hz @ +9 dB/oct
 270 - 1000 Hz @ $0.18 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.09 \text{ g}^2/\text{Hz}$

Composite = $16.7 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-1-B Input to Components mounted on Baffles and Stiffened Skin on the LH₂ Tank, Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and NOT within ±10° of the GO₂ Press. Line/Cable Tray Installation.
Weight of Component ≥ 15 but < 45 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0063 g²/Hz
20 - 96 Hz @ +9 dB/oct
96 - 160 Hz @ 0.63 g²/Hz
160 - 280 Hz @ -6 dB/oct
280 - 900 Hz @ 0.22 g²/Hz
900 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.045 g²/Hz

Composite = 18.2 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00033 g²/Hz
20 - 72 Hz @ +9 dB/oct
72 - 220 Hz @ 0.013 g²/Hz
220 - 270 Hz @ +9 dB/oct
270 - 1000 Hz @ 0.023 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.011 g²/Hz

Composite = 5.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.042 g²/Hz
20 - 52 Hz @ +6 dB/oct
52 - 120 Hz @ 0.28 g²/Hz
120 - 170 Hz @ +6 dB/oct
170 - 900 Hz @ 0.56 g²/Hz
900 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.26 g²/Hz

Composite = 29.4 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00039 g²/Hz
20 - 80 Hz @ +9 dB/oct
80 - 440 Hz @ 0.024 g²/Hz
440 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.060 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.030 g²/Hz

Composite = 8.9 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.025 g²/Hz
20 - 96 Hz @ +9 dB/oct
96 - 160 Hz @ 2.5 g²/Hz
160 - 280 Hz @ -6 dB/oct
280 - 900 Hz @ 0.86 g²/Hz
900 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.18 g²/Hz

Composite = 36.4 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0013 g²/Hz
20 - 72 Hz @ +9 dB/oct
72 - 220 Hz @ 0.05 g²/Hz
220 - 270 Hz @ +9 dB/oct
270 - 1000 Hz @ 0.09 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.045 g²/Hz

Composite = 11.8 g_{rms}

2-3-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-1-C Input to Components mounted on Baffles and Stiffened Skin on the LH₂ Tank, Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and not within ±10° of the GO₂ Press. Line/Cable Tray Installation.
Weight of Component \geq 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.0063 g²/Hz
75 - 75 Hz @ +9 dB/oct
160 - 160 Hz @ 0.3 g²/Hz
280 - 280 Hz @ -6 dB/oct
900 - 900 Hz @ 0.1 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.021 g²/Hz

Composite = 12.8 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00033 g²/Hz
56 - 56 Hz @ +9 dB/oct
220 - 220 Hz @ 0.011 g²/Hz
270 - 270 Hz @ +9 dB/oct
1000 - 1000 Hz @ 0.0063
2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.0058 g²/Hz

Composite = 4.2 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.042 g²/Hz
37 - 37 Hz @ +6 dB/oct
85 - 85 Hz @ 0.14 g²/Hz
120 - 120 Hz @ +6 dB/oct
900 - 900 Hz @ 0.28 g²/Hz
2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.13 g²/Hz

Composite = 20.9 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00039 g²/Hz
63 - 63 Hz @ +9 dB/oct
440 - 440 Hz @ 0.012 g²/Hz
700 - 700 Hz @ +6 dB/oct
1000 - 1000 Hz @ 0.030 g²/Hz
2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.015 g²/Hz

Composite = 6.4 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ 0.025 g²/Hz
75 - 75 Hz @ +9 dB/oct
160 - 160 Hz @ 1.2 g²/Hz
280 - 280 Hz @ -6 dB/oct
900 - 900 Hz @ 0.4 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.082 g²/Hz

Composite = 25.5 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.0013 g²/Hz
56 - 56 Hz @ +9 dB/oct
220 - 220 Hz @ 0.025 g²/Hz
270 - 270 Hz @ +9 dB/oct
1000 - 1000 Hz @ 0.045 g²/Hz
2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.023 g²/Hz

Composite = 8.4 g_{rms}

2-3-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-1-AP Input to Components mounted on Baffles and Stiffened Skin on the LH₂ Tank, Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component < 15 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0063 g²/Hz
 20 - 150 Hz @ +9 dB/oct
 150 - 250 Hz @ 2.5 g²/Hz
 250 - 360 Hz @ -10 dB/oct
 360 - 900 Hz @ 0.75 g²/Hz
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.16 g²/Hz

Composite = 35.6 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00033 g²/Hz
 20 - 90 Hz @ +9 dB/oct
 90 - 140 Hz @ 0.025 g²/Hz
 140 - 210 Hz @ +9 dB/oct
 210 - 1000 Hz @ 0.075 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.038 g²/Hz

Composite = 10.8 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.042 g²/Hz
 20 - 75 Hz @ +6 dB/oct
 75 - 170 Hz @ 0.56 g²/Hz
 170 - 240 Hz @ +6 dB/oct
 240 - 900 Hz @ 1.13 g²/Hz
 900 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.51 g²/Hz

Composite = 41.0 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00039 g²/Hz
 20 - 100 Hz @ +9 dB/oct
 100 - 440 Hz @ 0.048 g²/Hz
 440 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ 0.12 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.061 g²/Hz

Composite = 12.6 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.025 g²/Hz
 20 - 150 Hz @ +9 dB/oct
 150 - 250 Hz @ 10.0 g²/Hz
 250 - 360 Hz @ -10 dB/oct
 360 - 900 Hz @ 3.0 g²/Hz
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.62 g²/Hz

Composite = 71.2 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0013 g²/Hz
 20 - 90 Hz @ +9 dB/oct
 90 - 140 Hz @ 0.1 g²/Hz
 140 - 210 Hz @ +9 dB/oct
 210 - 1000 Hz @ 0.3 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.15 g²/Hz

Composite = 21.6 g_{rms}

2-3-1-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-1-BP Input to Components mounted on Baffles and Stiffened Skin on the LH₂ Tank, Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and within ± 10° of the GO₂ Press. Line/Cable Tray Installation.
 Weight of Component ≥ 15 lb. but < 45 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0063 g²/Hz
 20 - 120 Hz @ +9 dB/oct
 120 - 250 Hz @ 1.3 g²/Hz
 250 - 360 Hz @ -10 dB/oct
 360 - 900 Hz @ 0.38 g²/Hz
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.075 g²/Hz

Composite = 25.8 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00033 g²/Hz
 20 - 72 Hz @ +9 dB/oct
 72 - 140 Hz @ 0.013 g²/Hz
 140 - 210 Hz @ +9 dB/oct
 210 - 1000 Hz @ 0.038 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.019 g²/Hz

Composite = 7.7 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.042 g²/Hz
 20 - 52 Hz @ +6 dB/oct
 52 - 120 Hz @ 0.28 g²/Hz
 120 - 170 Hz @ +6 dB/oct
 170 - 900 Hz @ 0.56 g²/Hz
 900 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.26 g²/Hz

Composite = 29.4 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00039 g²/Hz
 20 - 80 Hz @ +9 dB/oct
 80 - 440 Hz @ 0.024 g²/Hz
 440 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ 0.060 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.030 g²/Hz

Composite = 8.9 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.025 g²/Hz
 20 - 120 Hz @ +9 dB/oct
 120 - 250 Hz @ 5.0 g²/Hz
 250 - 360 Hz @ -10 dB/oct
 360 - 900 Hz @ 1.5 g²/Hz
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.30 g²/Hz

Composite = 51.6 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0013 g²/Hz
 20 - 72 Hz @ +9 dB/oct
 72 - 140 Hz @ 0.05 g²/Hz
 140 - 210 Hz @ +9 dB/oct
 210 - 1000 Hz @ 0.15 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.075 g²/Hz

Composite = 15.3 g_{rms}

2-3-1-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes -

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-1-CP Input to Components mounted on Baffles and Stiffened Skin on the LH₂ Tank, Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component ≥ 45 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0063 g²/Hz
 20 - 96 Hz @ +9 dB/oct
 96 - 250 Hz @ 0.63 g²/Hz
 250 - 360 Hz @ -10 dB/oct
 360 - 900 Hz @ 0.19 g²/Hz
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.038 g²/Hz

Composite = 18.6 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00033 g²/Hz
 20 - 56 Hz @ +9 dB/oct
 56 - 140 Hz @ 0.0063 g²/Hz
 140 - 210 Hz @ +9 dB/oct
 210 - 1000 Hz @ 0.019 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.0095 g²/Hz

Composite = 5.4 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.042 g²/Hz
 20 - 37 Hz @ +6 dB/oct
 37 - 85 Hz @ 0.14 g²/Hz
 85 - 120 Hz @ +6 dB/oct
 120 - 900 Hz @ 0.28 g²/Hz
 900 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.13 g²/Hz

Composite = 20.9 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00039 g²/Hz
 20 - 63 Hz @ +9 dB/oct
 63 - 440 Hz @ 0.012 g²/Hz
 440 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ 0.030 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.015 g²/Hz

Composite = 6.4 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.025 g²/Hz
 20 - 96 Hz @ +9 dB/oct
 96 - 250 Hz @ 2.5 g²/Hz
 250 - 360 Hz @ -10 dB/oct
 360 - 900 Hz @ 0.75 g²/Hz
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.15 g²/Hz

Composite = 37.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0013 g²/Hz
 20 - 56 Hz @ +9 dB/oct
 56 - 140 Hz @ 0.025 g²/Hz
 140 - 210 Hz @ +9 dB/oct
 210 - 1000 Hz @ 0.075 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.038 g²/Hz

Composite = 10.8 g_{rms}

2-3-1-CP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-1-DP Input to Components Mounted on Baffles and Stiffened Skin on the LH₂ Tank Forward Section (X_T 1624 to X_T 1123), Inboard Half (+Z ±90°) and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component > 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.0063 g²/Hz
 76 - 76 Hz @ +9 dB/oct
 250 - 250 Hz @ 0.31 g²/Hz
 360 - 360 Hz @ -10 dB/oct
 900 - 900 Hz @ 0.095 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.019 g²/Hz

Composite = 13.4 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00033 g²/Hz
 45 - 45 Hz @ +9 dB/oct
 140 - 140 Hz @ 0.0033 g²/Hz
 210 - 210 Hz @ +9 dB/oct
 1000 - 1000 Hz @ 0.0095 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.0048 g²/Hz

Composite = 3.8 g_{rms}

2. Lift-off Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.042 g²/Hz
 26 - 26 Hz @ +6 dB/oct
 85 - 85 Hz @ 0.07 g²/Hz
 120 - 120 Hz @ +6 dB/oct
 900 - 900 Hz @ 0.14 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.065 g²/Hz

Composite = 14.8 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00039 g²/Hz
 50 - 50 Hz @ +9 dB/oct
 440 - 440 Hz @ 0.006 g²/Hz
 700 - 700 Hz @ +6 dB/oct
 1000 - 1000 Hz @ 0.015 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.0075 g²/Hz

Composite = 4.5 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ 0.025 g²/Hz
 76 - 76 Hz @ +9 dB/oct
 250 - 250 Hz @ 1.25 g²/Hz
 360 - 360 Hz @ -10 dB/oct
 900 - 900 Hz @ 0.38 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.075 g²/Hz

Composite = 26.7 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.0013 g²/Hz
 45 - 45 Hz @ +9 dB/oct
 140 - 140 Hz @ 0.013 g²/Hz
 210 - 210 Hz @ +9 dB/oct
 1000 - 1000 Hz @ 0.038 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.019 g²/Hz

Composite = 7.6 g_{rms}

2-3-1-DP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-2 Structural Rings at Stations X_T 1624 and X_T 1377 in the ET LH_2 Cylinder, Inboard Half (+Z Axis $\pm 90^\circ$).
(General Specifications)

Same as Subzone 2-3-2-A below.

Subzone 2-3-2-A Input to Components mounted on Structural Ring at X_T 1624 and X_T 1377 in the LH_2 Tank, Inboard Half (+Z $\pm 90^\circ$), and not within $\pm 10^\circ$ of the GO_2 Press.
Line/Cable Tray Installation. Weight of Component < 30 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.02 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +6 dB/oct
60 - 350 Hz @ $0.18 \text{ g}^2/\text{Hz}$
350 - 500 Hz @ +10 dB/oct
500 - 1000 Hz @ $0.63 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.063 \text{ g}^2/\text{Hz}$

Composite = $25.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +3 dB/oct
50 - 190 Hz @ $0.033 \text{ g}^2/\text{Hz}$
190 - 400 Hz @ +10 dB/oct
400 - 900 Hz @ $0.38 \text{ g}^2/\text{Hz}$
900 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.028 \text{ g}^2/\text{Hz}$

Composite = $18.7 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0061 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 290 Hz @ $0.15 \text{ g}^2/\text{Hz}$
290 - 500 Hz @ +9 dB/oct
500 - 850 Hz @ $0.80 \text{ g}^2/\text{Hz}$
850 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.15 \text{ g}^2/\text{Hz}$

Composite = $28.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +6 dB/oct
60 - 190 Hz @ $0.060 \text{ g}^2/\text{Hz}$
190 - 340 Hz @ +9 dB/oct
340 - 2000 Hz @ $0.34 \text{ g}^2/\text{Hz}$

Composite = $24.2 \text{ g}_{\text{rms}}$

2-3-2-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.078 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 60 - 350 Hz @ $0.7 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 1000 Hz @ $2.5 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.25 \text{ g}^2/\text{Hz}$

Composite = $50.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.053 \text{ g}^2/\text{Hz}$
 50 - 50 Hz @ +3 dB/oct
 50 - 190 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 190 - 400 Hz @ +10 dB/oct
 400 - 900 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.11 \text{ g}^2/\text{Hz}$

Composite = $37.3 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-2-B Input to Components mounted on Structural Ring at X_T 1624 and X_T 1377 in the LH_2 Tank, Inboard Half (+Z $\pm 90^\circ$), and not within $\pm 10^\circ$ of the GO_2 Press.
Line/Cable Tray Installation. Weight of Component ≥ 30 but < 90 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ $0.02 \text{ g}^2/\text{Hz}$	20 - 20 Hz @ $0.0093 \text{ g}^2/\text{Hz}$
43 - 43 Hz @ +6 dB/oct	35 - 35 Hz @ +3 dB/oct
43 - 340 Hz @ $0.09 \text{ g}^2/\text{Hz}$	35 - 190 Hz @ $0.016 \text{ g}^2/\text{Hz}$
340 - 500 Hz @ +10 dB/oct	190 - 400 Hz @ +10 dB/oct
500 - 1000 Hz @ $0.3 \text{ g}^2/\text{Hz}$	400 - 900 Hz @ $0.19 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -10 dB/oct	900 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.03 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.014 \text{ g}^2/\text{Hz}$
Composite = $17.6 \text{ g}_{\text{rms}}$	Composite = $13.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ $0.0061 \text{ g}^2/\text{Hz}$	20 - 20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
72 - 72 Hz @ +6 dB/oct	42 - 42 Hz @ +6 dB/oct
72 - 290 Hz @ $0.075 \text{ g}^2/\text{Hz}$	42 - 190 Hz @ $0.030 \text{ g}^2/\text{Hz}$
290 - 500 Hz @ +9 dB/oct	190 - 340 Hz @ +9 dB/oct
500 - 850 Hz @ $0.40 \text{ g}^2/\text{Hz}$	340 - 2000 Hz @ $0.17 \text{ g}^2/\text{Hz}$
850 - 2000 Hz @ -6 dB/oct	
2000 Hz @ $0.072 \text{ g}^2/\text{Hz}$	
Composite = $19.9 \text{ g}_{\text{rms}}$	Composite = $17.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ $0.078 \text{ g}^2/\text{Hz}$	20 - 20 Hz @ $0.037 \text{ g}^2/\text{Hz}$
43 - 43 Hz @ +6 dB/oct	35 - 35 Hz @ +3 dB/oct
43 - 340 Hz @ $0.35 \text{ g}^2/\text{Hz}$	35 - 190 Hz @ $0.065 \text{ g}^2/\text{Hz}$
340 - 500 Hz @ +10 dB/oct	190 - 400 Hz @ +10 dB/oct
500 - 1000 Hz @ $1.2 \text{ g}^2/\text{Hz}$	400 - 900 Hz @ $0.75 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -10 dB/oct	900 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.054 \text{ g}^2/\text{Hz}$
Composite = $35.1 \text{ g}_{\text{rms}}$	Composite = $26.4 \text{ g}_{\text{rms}}$

2-3-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-2-C Input to Components mounted on Structural Ring at X_T 1624 and X_T 1377 in the LH_2 Tank, Inboard Half ($+Z \pm 90^\circ$), and not within $\pm 10^\circ$ of the GO_2 Press.
Line/Cable Tray Installation. Weight of Component ≥ 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 30 Hz @ 0.02 g^2 /Hz	20 - 25 Hz @ 0.0065 g^2 /Hz
30 - 340 Hz @ +6 dB/oct	25 - 190 Hz @ 0.008 g^2 /Hz
340 - 500 Hz @ +10 dB/oct	190 - 400 Hz @ +10 dB/oct
500 - 1000 Hz @ 0.15 g^2 /Hz	400 - 900 Hz @ 0.093 g^2 /Hz
1000 - 2000 Hz @ -10 dB/oct	900 - 2000 Hz @ -10 dB/oct
2000 Hz @ 0.015 g^2 /Hz	2000 Hz @ 0.0068 g^2 /Hz
Composite = 12.4 g_{rms}	Composite = 9.3 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 50 Hz @ 0.0061 g^2 /Hz	20 - 30 Hz @ 0.0065 g^2 /Hz
50 - 290 Hz @ 0.038 g^2 /Hz	30 - 190 Hz @ 0.015 g^2 /Hz
290 - 500 Hz @ +9 dB/oct	190 - 340 Hz @ +9 dB/oct
500 - 850 Hz @ 0.20 g^2 /Hz	340 - 2000 Hz @ 0.085 g^2 /Hz
850 - 2000 Hz @ -6 dB/oct	
2000 Hz @ 0.036 g^2 /Hz	
Composite = 14.1 g_{rms}	Composite = 12.1 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 30 Hz @ 0.078 g^2 /Hz	20 - 25 Hz @ 0.026 g^2 /Hz
30 - 340 Hz @ +6 dB/oct	25 - 190 Hz @ 0.032 g^2 /Hz
340 - 500 Hz @ +10 dB/oct	190 - 400 Hz @ +10 dB/oct
500 - 1000 Hz @ 0.6 g^2 /Hz	400 - 900 Hz @ 0.37 g^2 /Hz
1000 - 2000 Hz @ -10 dB/oct	900 - 2000 Hz @ -10 dB/oct
2000 Hz @ 0.06 g^2 /Hz	2000 Hz @ 0.027 g^2 /Hz
Composite = 24.8 g_{rms}	Composite = 18.5 g_{rms}

2-3-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-2-AP Input to Components mounted on Structural Ring at X_T 1624 and X_T 1377 in the LH_2 Tank, Inboard Half (+Z $\pm 90^\circ$) and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 30 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.02 \text{ g}^2/\text{Hz}$
 64 - 64 Hz @ +6 dB/oct
 120 - 120 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 200 - 200 Hz @ +6 dB/oct
 340 - 340 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 500 - 500 Hz @ +10 dB/oct
 800 - 800 Hz @ $1.8 \text{ g}^2/\text{Hz}$
 2000 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.088 \text{ g}^2/\text{Hz}$

Composite = $36.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 50 - 50 Hz @ +3 dB/oct
 130 - 130 Hz @ $0.033 \text{ g}^2/\text{Hz}$
 400 - 400 Hz @ +9 dB/oct
 800 - 800 Hz @ $0.95 \text{ g}^2/\text{Hz}$
 2000 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.045 \text{ g}^2/\text{Hz}$

Composite = $27.7 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.0061 \text{ g}^2/\text{Hz}$
 100 - 100 Hz @ +6 dB/oct
 290 - 290 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 500 - 500 Hz @ +9 dB/oct
 850 - 850 Hz @ $0.80 \text{ g}^2/\text{Hz}$
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.15 \text{ g}^2/\text{Hz}$

Composite = $28.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 190 - 190 Hz @ $0.060 \text{ g}^2/\text{Hz}$
 340 - 340 Hz @ +9 dB/oct
 2000 - 2000 Hz @ $0.34 \text{ g}^2/\text{Hz}$

Composite = $24.2 \text{ g}_{\text{rms}}$

2-3-2-AP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

	20 Hz @ 0.078 g^2/Hz
20 -	64 Hz @ +6 dB/oct
64 -	120 Hz @ 0.8 g^2/Hz
120 -	200 Hz @ +6 dB/oct
200 -	340 Hz @ 2.0 g^2/Hz
340 -	500 Hz @ +10 dB/oct
500 -	800 Hz @ 7.0 g^2/Hz
800 -	2000 Hz @ -10 dB/oct
	2000 Hz @ 0.35 g^2/Hz

Composite = 72.8 g_{rms}

Long. and Tang. Axes

	20 Hz @ 0.053 g^2/Hz
20 -	50 Hz @ +3 dB/oct
50 -	130 Hz @ 0.13 g^2/Hz
130 -	400 Hz @ +9 dB/oct
400 -	800 Hz @ 3.8 g^2/Hz
800 -	2000 Hz @ -10 dB/oct
	2000 Hz @ 0.18 g^2/Hz

Composite = 55.3 g_{rms}

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 -	5 Hz @ 0.6 G's peak*
5 -	40 Hz @ 0.6 G's peak

Lateral Axes

2 -	5 Hz @ 0.8 G's peak*
5 -	40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-2-BP Input to Components mounted on Structural Ring at \bar{X}_T 1624 and X_T 1377 in the LH_2 Tank, Inboard Half (+Z $\pm 90^\circ$) and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 30 but < 90 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.02 \text{ g}^2/\text{Hz}$
 20 - 46 Hz @ +6 dB/oct
 46 - 120 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 120 - 200 Hz @ +6 dB/oct
 200 - 340 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 340 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.88 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.043 \text{ g}^2/\text{Hz}$

Composite = $25.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0093 \text{ g}^2/\text{Hz}$
 20 - 35 Hz @ +3 dB/oct
 35 - 130 Hz @ $0.016 \text{ g}^2/\text{Hz}$
 130 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $0.48 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $19.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0061 \text{ g}^2/\text{Hz}$
 20 - 72 Hz @ +6 dB/oct
 72 - 290 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 290 - 500 Hz @ +9 dB/oct
 500 - 850 Hz @ $0.40 \text{ g}^2/\text{Hz}$
 850 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.072 \text{ g}^2/\text{Hz}$

Composite = $19.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 190 Hz @ $0.030 \text{ g}^2/\text{Hz}$
 190 - 340 Hz @ +9 dB/oct
 340 - 2000 Hz @ $0.17 \text{ g}^2/\text{Hz}$

Composite = $17.4 \text{ g}_{\text{rms}}$

2-3-2-BP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.078 \text{ g}^2/\text{Hz}$
20 - 46 Hz @ +6 dB/oct
46 - 120 Hz @ $0.4 \text{ g}^2/\text{Hz}$
120 - 200 Hz @ +6 dB/oct
200 - 340 Hz @ $1.0 \text{ g}^2/\text{Hz}$
340 - 500 Hz @ +10 dB/oct
500 - 800 Hz @ $3.5 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.17 \text{ g}^2/\text{Hz}$

Composite = $51.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.037 \text{ g}^2/\text{Hz}$
20 - 35 Hz @ +3 dB/oct
35 - 130 Hz @ $0.065 \text{ g}^2/\text{Hz}$
130 - 400 Hz @ +9 dB/oct
400 - 800 Hz @ $1.9 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.094 \text{ g}^2/\text{Hz}$

Composite = $39.1 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-2-CP Input to Components mounted on Structural Ring At
 X_T 1624 and X_T 1377 in the LH_2 Tank, Inboard Half
 (+Z $\pm 90^\circ$), and within $\pm 10^\circ$ of the GO_2 Press. Line/
 Cable Tray Installation. Weight of Component ≥ 90 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.02 \text{ g}^2/\text{Hz}$
 20 - 32 Hz @ +6 dB/oct
 32 - 120 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 120 - 200 Hz @ +6 dB/oct
 200 - 340 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 340 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.43 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.021 \text{ g}^2/\text{Hz}$

Composite = $18.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
 20 - 25 Hz @ +3 dB/oct
 25 - 130 Hz @ $0.008 \text{ g}^2/\text{Hz}$
 130 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $0.21 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.01 \text{ g}^2/\text{Hz}$

Composite = $13.1 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0061 \text{ g}^2/\text{Hz}$
 20 - 50 Hz @ +6 dB/oct
 50 - 290 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 290 - 500 Hz @ +9 dB/oct
 500 - 850 Hz @ $0.20 \text{ g}^2/\text{Hz}$
 850 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.036 \text{ g}^2/\text{Hz}$

Composite = $14.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 190 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 190 - 340 Hz @ +9 dB/oct
 340 - 2000 Hz @ $0.085 \text{ g}^2/\text{Hz}$

Composite = $12.1 \text{ g}_{\text{rms}}$

2-3-2-CP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

	20 Hz @ 0.078 g^2/Hz
20 -	32 Hz @ +6 dB/oct
32 -	120 Hz @ 0.2 g^2/Hz
120 -	200 Hz @ +6 dB/oct
200 -	340 Hz @ 0.5 g^2/Hz
340 -	500 Hz @ +10 dB/oct
500 -	800 Hz @ 1.7 g^2/Hz
800 -	2000 Hz @ -10 dB/oct
	2000 Hz @ 0.082 g^2/Hz

Composite = 36.0 g_{rms}

Long. and Tang. Axes

	20 Hz @ 0.026 g^2/Hz
20 -	25 Hz @ +3 dB/oct
25 -	130 Hz @ 0.032 g^2/Hz
130 -	400 Hz @ +9 dB/oct
400 -	800 Hz @ 0.85 g^2/Hz
800 -	2000 Hz @ -10 dB/oct
	2000 Hz @ 0.04 g^2/Hz

Composite = 26.2 g_{rms}

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 -	5 Hz @ 0.6 G's peak*
5 -	40 Hz @ 0.6 G's peak

Lateral Axes

2 -	5 Hz @ 0.8 G's peak*
5 -	40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-3 Structural Ring at Station X_T 1130 in the ET LH_2 Cylinder, Inboard Half (+Z Axis $\pm 90^\circ$). (General Specifications)

Same as Subzone 2-3-3-A below.

Subzone 2-3-3-A Input to Components mounted on the Structural Ring X_T 1130 in the LH_2 Tank, Inboard Half (+Z $\pm 90^\circ$), and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 100 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 80 Hz @ 0.019 g^2/Hz	20 - 50 Hz @ 0.015 g^2/Hz
80 - 130 Hz @ +3 dB/oct	50 - 300 Hz @ 0.038 g^2/Hz
130 - 260 Hz @ -3 dB/oct	300 - 700 Hz @ +3 dB/oct
260 - 1500 Hz @ 0.04 g^2/Hz	700 - 1500 Hz @ 0.088 g^2/Hz
1500 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.023 g^2/Hz	2000 Hz @ 0.05 g^2/Hz
Composite = 8.9 g_{rms}	Composite = 11.7 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 120 Hz @ 0.016 g^2/Hz	20 - 50 Hz @ 0.032 g^2/Hz
120 - 200 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
200 - 250 Hz @ 0.18 g^2/Hz	1000 - 1400 Hz @ 0.26 g^2/Hz
250 - 1400 Hz @ -9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
1400 - 2000 Hz @ 0.090 g^2/Hz	2000 Hz @ 0.13 g^2/Hz
2000 Hz @ -9 dB/oct	
2000 Hz @ 0.031 g^2/Hz	
Composite = 12.8 g_{rms}	Composite = 19.1 g_{rms}

2-3-3-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.076 \text{ g}^2/\text{Hz}$
20 - 80 Hz @ +3 dB/oct
80 - 130 Hz @ $0.3 \text{ g}^2/\text{Hz}$
130 - 260 Hz @ -3 dB/oct
260 - 1500 Hz @ $0.16 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.09 \text{ g}^2/\text{Hz}$

Composite = $17.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.06 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +3 dB/oct
50 - 300 Hz @ $0.15 \text{ g}^2/\text{Hz}$
300 - 700 Hz @ +3 dB/oct
700 - 1500 Hz @ $0.35 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.2 \text{ g}^2/\text{Hz}$

Composite = $23.4 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-3-B Input to Components mounted on the Structural Ring at X_T 1130 in the LH_2 Tank, Inboard Half ($+Z \pm 90^\circ$), and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 100 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 20 - 58 Hz @ +3 dB/oct
 58 - 130 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 130 - 260 Hz @ -3 dB/oct
 260 - 1500 Hz @ $0.02 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.011 \text{ g}^2/\text{Hz}$

Composite = $6.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 35 Hz @ +3 dB/oct
 35 - 300 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 300 - 700 Hz @ +3 dB/oct
 700 - 1500 Hz @ $0.043 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $8.1 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +4 dB/oct
 100 - 200 Hz @ $0.090 \text{ g}^2/\text{Hz}$
 200 - 250 Hz @ -9 dB/oct
 250 - 1400 Hz @ $0.045 \text{ g}^2/\text{Hz}$
 1400 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $9.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 50 Hz @ $0.016 \text{ g}^2/\text{Hz}$
 50 - 1000 Hz @ +2 dB/oct
 1000 - 1400 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 1400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.065 \text{ g}^2/\text{Hz}$

Composite = $13.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.051 \text{ g}^2/\text{Hz}$
 20 - 58 Hz @ +3 dB/oct
 58 - 130 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 130 - 260 Hz @ -3 dB/oct
 260 - 1500 Hz @ $0.08 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.045 \text{ g}^2/\text{Hz}$

Composite = $12.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.042 \text{ g}^2/\text{Hz}$
 20 - 35 Hz @ +3 dB/oct
 35 - 300 Hz @ $0.074 \text{ g}^2/\text{Hz}$
 300 - 700 Hz @ +3 dB/oct
 700 - 1500 Hz @ $0.17 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.098 \text{ g}^2/\text{Hz}$

Composite = $16.2 \text{ g}_{\text{rms}}$

2-3-3-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-3-AP Input to Components mounted on the Structural Ring at X_T 1130 in the LH_2 Tank, Inboard Half (+Z $\pm 90^\circ$), and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 100 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 20 - 150 Hz @ +3 dB/oct
 150 - 250 Hz @ $0.14 \text{ g}^2/\text{Hz}$
 250 - 290 Hz @ -10 dB/oct
 290 - 1000 Hz @ $0.088 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.045 \text{ g}^2/\text{Hz}$

Composite = $12.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 20 - 50 Hz @ +3 dB/oct
 50 - 115 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 115 - 200 Hz @ +6 dB/oct
 200 - 400 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 400 - 600 Hz @ +3 dB/oct
 600 - 1500 Hz @ $0.17 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.093 \text{ g}^2/\text{Hz}$

Composite = $16.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.016 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +4 dB/oct
 120 - 200 Hz @ $0.18 \text{ g}^2/\text{Hz}$
 200 - 250 Hz @ -9 dB/oct
 250 - 1400 Hz @ $0.090 \text{ g}^2/\text{Hz}$
 1400 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.031 \text{ g}^2/\text{Hz}$

Composite = $12.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 50 Hz @ $0.032 \text{ g}^2/\text{Hz}$
 50 - 1000 Hz @ +2 dB/oct
 1000 - 1400 Hz @ $0.26 \text{ g}^2/\text{Hz}$
 1400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.13 \text{ g}^2/\text{Hz}$

Composite = $19.1 \text{ g}_{\text{rms}}$

2-3-3-AP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.076 \text{ g}^2/\text{Hz}$
20 - 150 Hz @ +3 dB/oct
150 - 250 Hz @ $0.56 \text{ g}^2/\text{Hz}$
250 - 290 Hz @ -10 dB/oct
290 - 1000 Hz @ $0.35 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.18 \text{ g}^2/\text{Hz}$

Composite = $24.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.06 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +3 dB/oct
50 - 115 Hz @ $0.15 \text{ g}^2/\text{Hz}$
115 - 200 Hz @ +6 dB/oct
200 - 400 Hz @ $0.45 \text{ g}^2/\text{Hz}$
400 - 600 Hz @ +3 dB/oct
600 - 1500 Hz @ $0.66 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.37 \text{ g}^2/\text{Hz}$

Composite = $32.9 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-3-3-BP Input to Components mounted on the Structural Ring at X_T 1130 in the LH₂ Tank, Inboard Half (+Z ±90°), and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component ≥ 100 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.013 g²/Hz
 20 - 110 Hz @ +3 dB/oct
 110 - 250 Hz @ 0.07 g²/Hz
 250 - 290 Hz @ -10 dB/oct
 290 - 1000 Hz @ 0.043 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.023 g²/Hz

Composite = 8.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.01 g²/Hz
 20 - 36 Hz @ +3 dB/oct
 36 - 115 Hz @ 0.019 g²/Hz
 115 - 200 Hz @ +6 dB/oct
 200 - 400 Hz @ 0.055 g²/Hz
 400 - 600 Hz @ +3 dB/oct
 600 - 1500 Hz @ 0.083 g²/Hz
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.048 g²/Hz

Composite = 11.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.11 g²/Hz
 20 - 100 Hz @ +4 dB/oct
 100 - 200 Hz @ 0.090 g²/Hz
 200 - 250 Hz @ -9 dB/oct
 250 - 1400 Hz @ 0.045 g²/Hz
 1400 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.015 g²/Hz

Composite = 9.1 g_{rms}

Long. and Tang. Axes

20 - 50 Hz @ 0.016 g²/Hz
 50 - 1000 Hz @ +2 dB/oct
 1000 - 1400 Hz @ 0.13 g²/Hz
 1400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.065 g²/Hz

Composite = 13.5 g_{rms}

2-3-3-BP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 20 - 110 Hz @ +3 dB/oct
 110 - 250 Hz @ $0.28 \text{ g}^2/\text{Hz}$
 250 - 290 Hz @ -10 dB/oct
 290 - 1000 Hz @ $0.17 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.09 \text{ g}^2/\text{Hz}$

Composite = $17.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.041 \text{ g}^2/\text{Hz}$
 20 - 36 Hz @ +3 dB/oct
 36 - 115 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 115 - 200 Hz @ +6 dB/oct
 200 - 400 Hz @ $0.22 \text{ g}^2/\text{Hz}$
 400 - 600 Hz @ +3 dB/oct
 600 - 1500 Hz @ $0.33 \text{ g}^2/\text{Hz}$
 1500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.19 \text{ g}^2/\text{Hz}$

Composite = $23.0 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4 ET LH₂ Cylinder, Forward Section (Stations X_T 1624 to X_T 1130), Outboard Half (-Z Axis ±90°). (General Specifications)

Same as Subzone 2-4-1-A below.

Subzone 2-4-1 Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 1624 to X_T 1130), Outboard Half (-Z Axis ±90°). (General Specifications)

Same as Subzone 2-4-1-A below.

Subzone 2-4-1-A Input to Components Mounted on Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Sections (Stations X_T 1624 to X_T 1130), Outboard Half (-Z Axis ±90°).
Weight of Component < 15 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.013 g²/Hz
75 Hz @ +6 dB/oct
75 - 170 Hz @ 0.18 g²/Hz
170 - 240 Hz @ +6 dB/oct
240 - 900 Hz @ 0.35 g²/Hz
900 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.16 g²/Hz

Composite = 22.8 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00012 g²/Hz
100 Hz @ +9 dB/oct
100 - 440 Hz @ 0.015 g²/Hz
440 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.038 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.019 g²/Hz

Composite = 7.0 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.052 g²/Hz
75 Hz @ +6 dB/oct
75 - 170 Hz @ 0.70 g²/Hz
170 - 240 Hz @ +6 dB/oct
240 - 900 Hz @ 1.40 g²/Hz
900 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.63 g²/Hz

Composite = 45.6 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00048 g²/Hz
100 Hz @ +9 dB/oct
100 - 440 Hz @ 0.060 g²/Hz
440 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.15 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.075 g²/Hz

Composite = 14.0 g_{rms}

2-4-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.052 \text{ g}^2/\text{Hz}$
20 - 125 Hz @ +6 dB/oct
125 - 200 Hz @ $2.00 \text{ g}^2/\text{Hz}$
200 - 340 Hz @ -9 dB/oct
340 - 1000 Hz @ $0.40 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.10 \text{ g}^2/\text{Hz}$

Composite = $28.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0014 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 1000 Hz @ $0.035 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $7.5 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-1-B Input to Components Mounted on Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 1624 to X_T 1130), Outboard Half (-Z Axis ±90°).
 Weight of Component ≥ 15 but < 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.013 g²/Hz
 52 - 52 Hz @ +6 dB/oct
 120 - 120 Hz @ 0.088 g²/Hz
 170 - 170 Hz @ +6 dB/oct
 900 - 900 Hz @ 0.18 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.080 g²/Hz

Composite = 16.3 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00012 g²/Hz
 80 - 80 Hz @ +9 dB/oct
 440 - 440 Hz @ 0.0075 g²/Hz
 700 - 700 Hz @ +6 dB/oct
 1000 - 1000 Hz @ 0.019 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.0095 g²/Hz

Composite = 4.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.052 g²/Hz
 52 - 52 Hz @ +6 dB/oct
 120 - 120 Hz @ 0.35 g²/Hz
 170 - 170 Hz @ +6 dB/oct
 900 - 900 Hz @ 0.70 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.32 g²/Hz

Composite = 32.7 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00048 g²/Hz
 80 - 80 Hz @ +9 dB/oct
 440 - 440 Hz @ 0.030 g²/Hz
 700 - 700 Hz @ +6 dB/oct
 1000 - 1000 Hz @ 0.075 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.038 g²/Hz

Composite = 9.9 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ 0.052 g²/Hz
 87 - 87 Hz @ +6 dB/oct
 200 - 200 Hz @ 1.00 g²/Hz
 340 - 340 Hz @ -9 dB/oct
 1000 - 1000 Hz @ 0.20 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.050 g²/Hz

Composite = 20.9 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.0014 g²/Hz
 72 - 72 Hz @ +6 dB/oct
 1000 - 1000 Hz @ 0.018 g²/Hz
 2000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.0090 g²/Hz

Composite = 5.4 g_{rms}

2-4-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-1-C Input to Components Mounted on Baffles and Stiffened Skin on the ET LH₂ Cylinder, Aft Section (Stations X_T 1624 to X_T 1130), Outboard Half (-Z Axis ±90°).
Weight of Component ≥ 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.013 g²/Hz
20 - 37 Hz @ +6 dB/oct
37 - 85 Hz @ 0.045 g²/Hz
85 - 120 Hz @ +6 dB/oct
120 - 900 Hz @ 0.088 g²/Hz
900 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.040 g²/Hz

Composite = 11.6 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00012 g²/Hz
20 - 63 Hz @ +9 dB/oct
63 - 440 Hz @ 0.0038 g²/Hz
440 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.0095 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.0048 g²/Hz

Composite = 3.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.052 g²/Hz
20 - 37 Hz @ +6 dB/oct
37 - 85 Hz @ 0.18 g²/Hz
85 - 120 Hz @ +6 dB/oct
120 - 900 Hz @ 0.35 g²/Hz
900 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.16 g²/Hz

Composite = 23.3 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00048 g²/Hz
20 - 63 Hz @ +9 dB/oct
63 - 440 Hz @ 0.015 g²/Hz
440 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ 0.038 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.019 g²/Hz

Composite = 7.1 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.052 g²/Hz
20 - 62 Hz @ +6 dB/oct
62 - 200 Hz @ 0.50 g²/Hz
200 - 340 Hz @ -9 dB/oct
340 - 1000 Hz @ 0.10 g²/Hz
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.025 g²/Hz

Composite = 15.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0014 g²/Hz
20 - 67 Hz @ +6 dB/oct
67 - 1000 Hz @ 0.015 g²/Hz
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.0076 g²/Hz

Composite = 5.4 g_{rms}

2-4-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-2 Structural Rings at Stations X_T 1624 and X_T 1377 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$).
(General Specifications)

Same as Subzone 2-4-2-A below.

Subzone 2-4-2-A Input to Components Mounted on the Structural Rings at Stations X_T 1624 and X_T 1377 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of Component < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0021 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 280 Hz @ $0.052 \text{ g}^2/\text{Hz}$
280 - 490 Hz @ +9 dB/oct
490 - 800 Hz @ $0.28 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.045 \text{ g}^2/\text{Hz}$

Composite = $16.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0024 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +6 dB/oct
60 - 190 Hz @ $0.022 \text{ g}^2/\text{Hz}$
190 - 340 Hz @ +9 dB/oct
340 - 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $14.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0085 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 280 Hz @ $0.21 \text{ g}^2/\text{Hz}$
280 - 490 Hz @ +9 dB/oct
490 - 800 Hz @ $1.10 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.18 \text{ g}^2/\text{Hz}$

Composite = $32.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0096 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +6 dB/oct
60 - 190 Hz @ $0.088 \text{ g}^2/\text{Hz}$
190 - 340 Hz @ +9 dB/oct
340 - 2000 Hz @ $0.50 \text{ g}^2/\text{Hz}$

Composite = $29.3 \text{ g}_{\text{rms}}$

2-4-2-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.034 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 60 - 280 Hz @ $0.30 \text{ g}^2/\text{Hz}$
 280 - 500 Hz @ +6 dB/oct
 500 - 700 Hz @ $1.00 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.031 \text{ g}^2/\text{Hz}$

Composite = $26.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0067 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 60 - 270 Hz @ $0.060 \text{ g}^2/\text{Hz}$
 270 - 460 Hz @ +10 dB/oct
 460 - 800 Hz @ $0.36 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.017 \text{ g}^2/\text{Hz}$

Composite = $16.7 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-2-B Input to Components Mounted on the Structural Rings
at Stations X_T 1624 and X_T 1377 in the ET LH₂
Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of
Component ≥ 30 but < 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0021 \text{ g}^2/\text{Hz}$
20 - 71 Hz @ +6 dB/oct
71 - 280 Hz @ $0.028 \text{ g}^2/\text{Hz}$
280 - 490 Hz @ +9 dB/oct
490 - 800 Hz @ $0.14 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.022 \text{ g}^2/\text{Hz}$

Composite = $11.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0024 \text{ g}^2/\text{Hz}$
20 - 42 Hz @ +6 dB/oct
42 - 190 Hz @ $0.011 \text{ g}^2/\text{Hz}$
190 - 340 Hz @ +9 dB/oct
340 - 2000 Hz @ $0.062 \text{ g}^2/\text{Hz}$

Composite = $10.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0085 \text{ g}^2/\text{Hz}$
20 - 71 Hz @ +6 dB/oct
71 - 280 Hz @ $0.11 \text{ g}^2/\text{Hz}$
280 - 490 Hz @ +9 dB/oct
490 - 800 Hz @ $0.55 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.089 \text{ g}^2/\text{Hz}$

Composite = $22.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0096 \text{ g}^2/\text{Hz}$
20 - 42 Hz @ +6 dB/oct
42 - 190 Hz @ $0.044 \text{ g}^2/\text{Hz}$
190 - 340 Hz @ +9 dB/oct
340 - 2000 Hz @ $0.25 \text{ g}^2/\text{Hz}$

Composite = $21.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.024 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +6 dB/oct
50 - 280 Hz @ $0.15 \text{ g}^2/\text{Hz}$
280 - 500 Hz @ +6 dB/oct
500 - 700 Hz @ $0.50 \text{ g}^2/\text{Hz}$
700 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $18.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0048 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +6 dB/oct
50 - 270 Hz @ $0.030 \text{ g}^2/\text{Hz}$
270 - 460 Hz @ +10 dB/oct
460 - 800 Hz @ $0.18 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.0086 \text{ g}^2/\text{Hz}$

Composite = $11.8 \text{ g}_{\text{rms}}$

2-4-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-2-C Input to Components Mounted on the Structural Rings at Stations X_T 1624 and X_T 1377 in the ET LH₂ Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of Component ≥ 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0021 g^2/Hz
 20 - 50 Hz @ +6 dB/oct
 50 - 280 Hz @ 0.014 g^2/Hz
 280 - 490 Hz @ +9 dB/oct
 490 - 800 Hz @ 0.070 g^2/Hz
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.011 g^2/Hz

Composite = 8.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0024 g^2/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 190 Hz @ 0.0055 g^2/Hz
 190 - 340 Hz @ +9 dB/oct
 340 - 2000 Hz @ 0.030 g^2/Hz

Composite = 7.3 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0085 g^2/Hz
 20 - 50 Hz @ +6 dB/oct
 50 - 280 Hz @ 0.055 g^2/Hz
 280 - 490 Hz @ +9 dB/oct
 490 - 800 Hz @ 0.28 g^2/Hz
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.045 g^2/Hz

Composite = 16.3 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0096 g^2/Hz
 20 - 30 Hz @ +6 dB/oct
 30 - 190 Hz @ 0.022 g^2/Hz
 190 - 340 Hz @ +9 dB/oct
 340 - 2000 Hz @ 0.12 g^2/Hz

Composite = 14.7 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.015 g^2/Hz
 20 - 45 Hz @ +6 dB/oct
 45 - 280 Hz @ 0.075 g^2/Hz
 280 - 500 Hz @ +6 dB/oct
 500 - 700 Hz @ 0.25 g^2/Hz
 700 - 2000 Hz @ -10 dB/oct
 2000 Hz @ 0.0076 g^2/Hz

Composite = 13.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0030 g^2/Hz
 20 - 45 Hz @ +6 dB/oct
 45 - 270 Hz @ 0.015 g^2/Hz
 270 - 460 Hz @ +10 dB/oct
 460 - 800 Hz @ 0.090 g^2/Hz
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ 0.0043 g^2/Hz

Composite = 8.4 g_{rms}

2-4-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-3 Structural Ring at Station X_T 1130 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). (General Specifications)

Same as Subzone 2-4-3-A below.

Subzone 2-4-3-A Input to Components Mounted on the Structural Ring at Station X_T 1130 in the ET LH_2 Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of Component < 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0070 \text{ g}^2/\text{Hz}$	20 - 50 Hz @ $0.014 \text{ g}^2/\text{Hz}$
20 - 120 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
120 - 200 Hz @ $0.075 \text{ g}^2/\text{Hz}$	1000 - 1400 Hz @ $0.11 \text{ g}^2/\text{Hz}$
200 - 250 Hz @ -9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
250 - 1400 Hz @ $0.038 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.055 \text{ g}^2/\text{Hz}$
1400 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$	
Composite = $8.3 \text{ g}_{\text{rms}}$	Composite = $12.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.028 \text{ g}^2/\text{Hz}$	20 - 50 Hz @ $0.056 \text{ g}^2/\text{Hz}$
20 - 120 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
120 - 200 Hz @ $0.30 \text{ g}^2/\text{Hz}$	1000 - 1400 Hz @ $0.45 \text{ g}^2/\text{Hz}$
200 - 250 Hz @ -9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
250 - 1400 Hz @ $0.15 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.22 \text{ g}^2/\text{Hz}$
1400 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.052 \text{ g}^2/\text{Hz}$	
Composite = $16.6 \text{ g}_{\text{rms}}$	Composite = $25.2 \text{ g}_{\text{rms}}$

2-4-3-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.024 \text{ g}^2/\text{Hz}$
20 - 80 Hz @ +4 dB/oct
80 - 200 Hz @ $0.15 \text{ g}^2/\text{Hz}$
200 - 300 Hz @ -10 dB/oct
300 - 1500 Hz @ $0.040 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.023 \text{ g}^2/\text{Hz}$

Composite = $10.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.030 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +3 dB/oct
40 - 600 Hz @ $0.060 \text{ g}^2/\text{Hz}$
600 - 1000 Hz @ +3 dB/oct
1000 - 1500 Hz @ $0.10 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.056 \text{ g}^2/\text{Hz}$

Composite = $12.4 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-3-B Input to Components Mounted on the Structural Ring at Station X_T 1130 in the ET LH₂ Cylinder, Outboard Half (-Z Axis $\pm 90^\circ$). Weight of Component ≥ 45 but < 135 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.0045 g ² /Hz	20 - 50 Hz @ 0.0070 g ² /Hz
20 - 100 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
100 - 200 Hz @ 0.038 g ² /Hz	1000 - 1400 Hz @ 0.058 g ² /Hz
200 - 250 Hz @ -9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
250 - 1400 Hz @ 0.019 g ² /Hz	2000 Hz @ 0.028 g ² /Hz
1400 - 2000 Hz @ -9 dB/oct	
2000 Hz @ 0.0062 g ² /Hz	
Composite = 5.9 g _{rms}	Composite = 9.0 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.018 g ² /Hz	20 - 50 Hz @ 0.028 g ² /Hz
20 - 100 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
100 - 200 Hz @ 0.15 g ² /Hz	1000 - 1400 Hz @ 0.23 g ² /Hz
200 - 250 Hz @ -9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
250 - 1400 Hz @ 0.075 g ² /Hz	2000 Hz @ 0.11 g ² /Hz
1400 - 2000 Hz @ -9 dB/oct	
2000 Hz @ 0.025 g ² /Hz	
Composite = 11.8 g _{rms}	Composite = 18.0 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.014 g ² /Hz	20 Hz @ 0.015 g ² /Hz
20 - 80 Hz @ +4 dB/oct	20 - 40 Hz @ +3 dB/oct
80 - 190 Hz @ 0.090 g ² /Hz	40 - 600 Hz @ 0.030 g ² /Hz
190 - 300 Hz @ -10 dB/oct	600 - 1000 Hz @ +3 dB/oct
300 - 1500 Hz @ 0.020 g ² /Hz	1000 - 1500 Hz @ 0.050 g ² /Hz
1500 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.011 g ² /Hz	2000 Hz @ 0.028 g ² /Hz
Composite = 7.0 g _{rms}	Composite = 8.8 g _{rms}

2-4-3-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 2-4-3-C Input to Components Mounted on the Structural Ring
at Station X_T 1130 in the ET LH₂ Cylinder, Outboard
 Half (-Z Axis $\pm 90^\circ$). Weight of Component ≥ 135 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0030 \text{ g}^2/\text{Hz}$	20 - 50 Hz @ $0.0035 \text{ g}^2/\text{Hz}$
20 - 80 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
80 - 200 Hz @ $0.019 \text{ g}^2/\text{Hz}$	1000 - 1400 Hz @ $0.030 \text{ g}^2/\text{Hz}$
200 - 250 Hz @ +9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
250 - 1400 Hz @ $0.095 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.017 \text{ g}^2/\text{Hz}$
1400 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.0032 \text{ g}^2/\text{Hz}$	
Composite = $4.2 \text{ g}_{\text{rms}}$	Composite = $6.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.012 \text{ g}^2/\text{Hz}$	20 - 50 Hz @ $0.014 \text{ g}^2/\text{Hz}$
20 - 80 Hz @ +4 dB/oct	50 - 1000 Hz @ +2 dB/oct
80 - 200 Hz @ $0.075 \text{ g}^2/\text{Hz}$	1000 - 1400 Hz @ $0.12 \text{ g}^2/\text{Hz}$
200 - 250 Hz @ -9 dB/oct	1400 - 2000 Hz @ -6 dB/oct
250 - 1400 Hz @ $0.038 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.059 \text{ g}^2/\text{Hz}$
1400 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$	
Composite = $8.5 \text{ g}_{\text{rms}}$	Composite = $13.0 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.011 \text{ g}^2/\text{Hz}$	20 Hz @ $0.0075 \text{ g}^2/\text{Hz}$
20 - 70 Hz @ +4 dB/oct	20 - 40 Hz @ +3 dB/oct
70 - 175 Hz @ $0.060 \text{ g}^2/\text{Hz}$	40 - 600 Hz @ $0.015 \text{ g}^2/\text{Hz}$
175 - 300 Hz @ -10 dB/oct	600 - 1000 Hz @ +3 dB/oct
300 - 1500 Hz @ $0.010 \text{ g}^2/\text{Hz}$	1000 - 1500 Hz @ $0.025 \text{ g}^2/\text{Hz}$
1500 - 2000 Hz @ -6 dB/oct	1500 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0056 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.014 \text{ g}^2/\text{Hz}$
Composite = $5.1 \text{ g}_{\text{rms}}$	Composite = $6.2 \text{ g}_{\text{rms}}$

2-4-3-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Zone 3 ET Intertank

Subzone 3-1 ET Intertank (Stations X_T 1130 to X_T 852), Panels 1, 2, and 3 (General Specifications).

Same as Subzone 3-1-1 below.

Subzone 3-1-1 Structural Rings at Stations X_T 1082, X_T 1034, X_T 941, and X_T 897 in Panels 1, 2, and 3 of the ET Intertank (General Specifications).

Same as Subzone 3-1-1-1A below.

Subzone 3-1-1-1-A Input to Components mounted on Structural Rings at X_T 941 and X_T 897 in Panels 1, 2, and 3 of the Intertank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 25 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.028 g^2/Hz$
20 - 60 Hz @ +6 dB/oct
60 - 310 Hz @ $0.23 g^2/Hz$
310 - 400 Hz @ +9 dB/oct
400 - 800 Hz @ $0.5 g^2/Hz$
800 - 2000 Hz @ -12 dB/oct
2000 Hz @ $0.015 g^2/Hz$

Composite = $20.5 g_{rms}$

Long. and Tang. Axes

20 Hz @ $0.0058 g^2/Hz$
20 - 60 Hz @ +6 dB/oct
60 - 270 Hz @ $0.05 g^2/Hz$
270 - 450 Hz @ +12 dB/oct
450 - 700 Hz @ $0.38 g^2/Hz$
700 - 2000 Hz @ -12 dB/oct
2000 Hz @ $0.0065 g^2/Hz$

Composite = $14.9 g_{rms}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 g^2/Hz$
20 - 60 Hz @ +9 dB/oct
60 - 350 Hz @ $0.3 g^2/Hz$
350 - 500 Hz @ +10 dB/oct
500 - 800 Hz @ $1.0 g^2/Hz$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.16 g^2/Hz$

Composite = $31.0 g_{rms}$

Long. and Tang. Axes

20 Hz @ $0.0026 g^2/Hz$
20 - 60 Hz @ +10 dB/oct
60 - 200 Hz @ $0.10 g^2/Hz$
200 - 350 Hz @ +9 dB/oct
350 - 800 Hz @ $0.50 g^2/Hz$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.080 g^2/Hz$

Composite = $22.9 g_{rms}$

3-1-1-1A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 60 - 310 Hz @ $0.9 \text{ g}^2/\text{Hz}$
 310 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $2.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.058 \text{ g}^2/\text{Hz}$

Composite = $40.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 60 - 270 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 270 - 450 Hz @ +12 dB/oct
 450 - 700 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.026 \text{ g}^2/\text{Hz}$

Composite = $29.7 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-1-B Input to Components mounted on Structural Rings at \bar{X}_T 941 and X_T 897 in Panels 1, 2, and 3 of the Inter-tank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 25 but < 75 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.028 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 310 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 310 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0073 \text{ g}^2/\text{Hz}$

Composite = $14.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0058 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 270 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 270 - 450 Hz @ +12 dB/oct
 450 - 700 Hz @ $0.19 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0033 \text{ g}^2/\text{Hz}$

Composite = $10.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +9 dB/oct
 48 - 350 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.08 \text{ g}^2/\text{Hz}$

Composite = $22 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +10 dB/oct
 48 - 200 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $16.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 310 Hz @ $0.45 \text{ g}^2/\text{Hz}$
 310 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.029 \text{ g}^2/\text{Hz}$

Composite = $29.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 270 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 270 - 450 Hz @ +12 dB/oct
 450 - 700 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$

Composite = $21.0 \text{ g}_{\text{rms}}$

3-1-1-1B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-1-C Input to Components mounted on Structural Rings at \bar{X}_T 941 and \bar{X}_T 897 in Panels 1, 2, and 3 of the Intertank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 75 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.028 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 310 Hz @ $0.055 \text{ g}^2/\text{Hz}$
 310 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0035 \text{ g}^2/\text{Hz}$

Composite = $10.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0058 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 270 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 270 - 450 Hz @ +12 dB/oct
 450 - 700 Hz @ $0.093 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0015 \text{ g}^2/\text{Hz}$

Composite = $7.4 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 38 Hz @ +9 dB/oct
 38 - 350 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.04 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +10 dB/oct
 40 - 200 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $11.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 310 Hz @ $0.22 \text{ g}^2/\text{Hz}$
 310 - 400 Hz @ +9 dB/oct
 400 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.014 \text{ g}^2/\text{Hz}$

Composite = $20.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 270 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 270 - 450 Hz @ +12 dB/oct
 450 - 700 Hz @ $0.37 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.006 \text{ g}^2/\text{Hz}$

Composite = $14.8 \text{ g}_{\text{rms}}$

3-1-1-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-1-AP Input to Components mounted on Structural Rings at X_T 941 and X_T 897 in Panels 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 25 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.063 \text{ g}^2/\text{Hz}$
 20 - 150 Hz @ +4 dB/oct
 150 - 540 Hz @ $0.88 \text{ g}^2/\text{Hz}$
 540 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.098 \text{ g}^2/\text{Hz}$

Composite = $38.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0038 \text{ g}^2/\text{Hz}$
 20 - 150 Hz @ +6 dB/oct
 150 - 360 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 360 - 500 Hz @ +12 dB/oct
 500 - 1000 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.098 \text{ g}^2/\text{Hz}$

Composite = $27.7 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +9 dB/oct
 60 - 350 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.16 \text{ g}^2/\text{Hz}$

Composite = $31.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +10 dB/oct
 60 - 200 Hz @ $0.10 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.50 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.080 \text{ g}^2/\text{Hz}$

Composite = $22.9 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 20 - 150 Hz @ +4 dB/oct
 150 - 540 Hz @ $3.5 \text{ g}^2/\text{Hz}$
 540 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $6.0 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.39 \text{ g}^2/\text{Hz}$

Composite = $76.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 20 - 150 Hz @ +6 dB/oct
 150 - 360 Hz @ $0.8 \text{ g}^2/\text{Hz}$
 360 - 500 Hz @ +12 dB/oct
 500 - 1000 Hz @ $3.0 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.39 \text{ g}^2/\text{Hz}$

Composite = $55.4 \text{ g}_{\text{rms}}$

3-1-1-1-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-1-BP Input to Components mounted on Structural Rings at X_T 941 and X_T 897 in Panels 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 25 but < 75 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.048 g^2/Hz$
 20 - 105 Hz @ +4 dB/oct
 105 - 540 Hz @ $0.43 g^2/Hz$
 540 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.75 g^2/Hz$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.05 g^2/Hz$

Composite = $27.3 g_{rms}$

Long. and Tang. Axes

20 Hz @ $0.048 g^2/Hz$
 20 - 105 Hz @ +6 dB/oct
 105 - 360 Hz @ $0.1 g^2/Hz$
 360 - 500 Hz @ +12 dB/oct
 500 - 1000 Hz @ $0.38 g^2/Hz$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.05 g^2/Hz$

Composite = $19.6 g_{rms}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 g^2/Hz$
 20 - 48 Hz @ +9 dB/oct
 48 - 350 Hz @ $0.15 g^2/Hz$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.5 g^2/Hz$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.08 g^2/Hz$

Composite = $22 g_{rms}$

Long. and Tang. Axes

20 Hz @ $0.0026 g^2/Hz$
 20 - 48 Hz @ +10 dB/oct
 48 - 200 Hz @ $0.050 g^2/Hz$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.25 g^2/Hz$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.040 g^2/Hz$

Composite = $16.2 g_{rms}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.19 g^2/Hz$
 20 - 105 Hz @ +4 dB/oct
 105 - 540 Hz @ $1.7 g^2/Hz$
 540 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $3.0 g^2/Hz$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.2 g^2/Hz$

Composite = $54.6 g_{rms}$

Long. and Tang. Axes

20 Hz @ $0.015 g^2/Hz$
 20 - 105 Hz @ +6 dB/oct
 105 - 360 Hz @ $0.4 g^2/Hz$
 360 - 500 Hz @ +12 dB/oct
 500 - 1000 Hz @ $1.5 g^2/Hz$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.2 g^2/Hz$

Composite = $39.2 g_{rms}$

3-1-1-1-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-1-CP Input to Components mounted on Structural Rings at X_T 961 and X_T 897 in Panel 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component > 75 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.0035 \text{ g}^2/\text{Hz}$
 76 - 76 Hz @ +4 dB/oct
 76 - 540 Hz @ $0.21 \text{ g}^2/\text{Hz}$
 540 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.38 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $19.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0038 \text{ g}^2/\text{Hz}$
 76 - 76 Hz @ +6 dB/oct
 76 - 300 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 360 - 500 Hz @ +12 dB/oct
 500 - 1000 Hz @ $0.19 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $13.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 38 - 38 Hz @ +9 dB/oct
 38 - 350 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.04 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 40 - 40 Hz @ +10 dB/oct
 40 - 200 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $11.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.14 \text{ g}^2/\text{Hz}$
 76 - 76 Hz @ +4 dB/oct
 76 - 540 Hz @ $0.85 \text{ g}^2/\text{Hz}$
 540 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.1 \text{ g}^2/\text{Hz}$

Composite = $38.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 76 - 76 Hz @ +6 dB/oct
 76 - 360 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 360 - 500 Hz @ +12 dB/oct
 500 - 1000 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.1 \text{ g}^2/\text{Hz}$

Composite = $27.8 \text{ g}_{\text{rms}}$

3-1-1-1-CP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-2-A Input to Components mounted on Structural Rings at \bar{X}_T 1082 and \bar{X}_T 1034 in Panels 1, 2 and 3 of the Intertank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 25 lbs.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 350 Hz @ $0.33 \text{ g}^2/\text{Hz}$
 350 - 430 Hz @ +9 dB/oct
 430 - 900 Hz @ $0.63 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.028 \text{ g}^2/\text{Hz}$

Composite = $24.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0083 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 300 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 300 - 480 Hz @ +12 dB/oct
 480 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $18.3 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +9 dB/oct
 60 - 350 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.16 \text{ g}^2/\text{Hz}$

Composite = $31.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +10 dB/oct
 60 - 200 Hz @ $0.10 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.50 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.080 \text{ g}^2/\text{Hz}$

Composite = $22.9 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 350 Hz @ $1.3 \text{ g}^2/\text{Hz}$
 350 - 430 Hz @ +9 dB/oct
 430 - 900 Hz @ $2.5 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.11 \text{ g}^2/\text{Hz}$

Composite = $49.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.033 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 300 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 300 - 480 Hz @ +12 dB/oct
 480 - 800 Hz @ $2.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.06 \text{ g}^2/\text{Hz}$

Composite = $36.5 \text{ g}_{\text{rms}}$

3-1-1-2-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-2-B Input to Components Mounted on Structural Rings at $\bar{X}_T 1082 + X_T 1034$ in Panels 1, 2 and 3 of the Inter-tank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 25 but < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 350 Hz @ $0.16 \text{ g}^2/\text{Hz}$
 350 - 430 Hz @ +9 dB/oct
 430 - 900 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$

Composite = $17.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0083 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 300 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 300 - 480 Hz @ +12 dB/oct
 480 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$

Composite = $13.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +9 dB/oct
 48 - 350 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.08 \text{ g}^2/\text{Hz}$

Composite = $22 \text{ g}_{\text{rms}}$

Long. and Tang. Axis

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +10 dB/oct
 48 - 200 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $16.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 350 Hz @ $0.64 \text{ g}^2/\text{Hz}$
 350 - 430 Hz @ +9 dB/oct
 430 - 900 Hz @ $1.2 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.05 \text{ g}^2/\text{Hz}$

Composite = $34.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.033 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 300 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 300 - 480 Hz @ +12 dB/oct
 480 - 800 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.03 \text{ g}^2/\text{Hz}$

Composite = $26.4 \text{ g}_{\text{rms}}$

3-1-1-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-2-C Input to Components Mounted on Structural Rings at X_T 1082 and X_T 1034 in Panels 1, 2 and 3 of the Intertank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 350 Hz @ $0.08 \text{ g}^2/\text{Hz}$
 350 - 430 Hz @ +9 dB/oct
 430 - 900 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0065 \text{ g}^2/\text{Hz}$

Composite = $12.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0083 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 300 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 300 - 480 Hz @ +12 dB/oct
 480 - 800 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0038 \text{ g}^2/\text{Hz}$

Composite = $9.4 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 38 Hz @ +9 dB/oct
 38 - 350 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.04 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +10 dB/oct
 40 - 200 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $11.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 350 Hz @ $0.32 \text{ g}^2/\text{Hz}$
 350 - 430 Hz @ +9 dB/oct
 430 - 900 Hz @ $0.6 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.026 \text{ g}^2/\text{Hz}$

Composite = $24.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.033 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +6 dB/oct
 30 - 300 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 300 - 480 Hz @ +12 dB/oct
 480 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $18.7 \text{ g}_{\text{rms}}$

3-1-1-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-2-AP Input to Components Mounted on Structural Rings at X_T 1082 and X_T 1034 in Panels 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 25 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +6 dB/oct
 60 - 120 Hz @ $0.33 \text{ g}^2/\text{Hz}$
 120 - 210 Hz @ +6 dB/oct
 210 - 400 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 400 - 480 Hz @ +9 dB/oct
 480 - 900 Hz @ $1.75 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.078 \text{ g}^2/\text{Hz}$

Composite = $39.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 200 - 200 Hz @ +3 dB/oct
 200 - 300 Hz @ $0.23 \text{ g}^2/\text{Hz}$
 300 - 500 Hz @ +12 dB/oct
 500 - 700 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.068 \text{ g}^2/\text{Hz}$

Composite = $31.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +9 dB/oct
 60 - 350 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.16 \text{ g}^2/\text{Hz}$

Composite = $31.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 60 - 60 Hz @ +10 dB/oct
 60 - 200 Hz @ $0.10 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.50 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.080 \text{ g}^2/\text{Hz}$

Composite = $22.9 \text{ g}_{\text{rms}}$

3-1-1-2-AP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

	20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
20 -	60 Hz @ +6 dB/oct
60 -	120 Hz @ $1.3 \text{ g}^2/\text{Hz}$
120 -	210 Hz @ +6 dB/oct
210 -	400 Hz @ $4.0 \text{ g}^2/\text{Hz}$
400 -	480 Hz @ +9 dB/oct
480 -	900 Hz @ $7.0 \text{ g}^2/\text{Hz}$
900 -	2000 Hz @ -12 dB/oct
	2000 Hz @ $0.31 \text{ g}^2/\text{Hz}$

Composite = $79.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

	20 Hz @ $0.09 \text{ g}^2/\text{Hz}$
20 -	200 Hz @ +3 dB/oct
200 -	300 Hz @ $0.9 \text{ g}^2/\text{Hz}$
300 -	500 Hz @ +12 dB/oct
500 -	700 Hz @ $6.0 \text{ g}^2/\text{Hz}$
700 -	2000 Hz @ -9 dB/oct
	2000 Hz @ $0.27 \text{ g}^2/\text{Hz}$

Composite = $63.2 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 -	5 Hz @ 0.6 G's peak*
5 -	40 Hz @ 0.6 G's peak

Lateral Axes

2 -	5 Hz @ 0.8 G's peak*
5 -	40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-2-BP Input to Components Mounted on Structural Rings at X_T 1082 and X_T 1034 in Panels 1, 2, and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 25 but < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +6 dB/oct
 42 - 120 Hz @ $0.16 \text{ g}^2/\text{Hz}$
 120 - 210 Hz @ +6 dB/oct
 210 - 400 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 400 - 480 Hz @ +9 dB/oct
 480 - 900 Hz @ $0.88 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.038 \text{ g}^2/\text{Hz}$

Composite = $28.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.016 \text{ g}^2/\text{Hz}$
 20 - 140 Hz @ +3 dB/oct
 140 - 300 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 300 - 500 Hz @ +12 dB/oct
 500 - 700 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.035 \text{ g}^2/\text{Hz}$

Composite = $22.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +9 dB/oct
 48 - 350 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 350 - 500 Hz @ +10 dB/oct
 500 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.08 \text{ g}^2/\text{Hz}$

Composite = $22 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +10 dB/oct
 48 - 200 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $16.2 \text{ g}_{\text{rms}}$

3-1-1-2-BP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 42 - 42 Hz @ +6 dB/oct
 42 - 120 Hz @ $0.65 \text{ g}^2/\text{Hz}$
 120 - 210 Hz @ +6 dB/oct
 210 - 400 Hz @ $2.0 \text{ g}^2/\text{Hz}$
 400 - 480 Hz @ +9 dB/oct
 480 - 900 Hz @ $3.5 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.15 \text{ g}^2/\text{Hz}$

Composite = $56.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.064 \text{ g}^2/\text{Hz}$
 20 - 140 Hz @ +3 dB/oct
 140 - 300 Hz @ $0.45 \text{ g}^2/\text{Hz}$
 300 - 500 Hz @ +12 dB/oct
 500 - 700 Hz @ $3.0 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.14 \text{ g}^2/\text{Hz}$

Composite = $44.9 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-1-2-CP Input to Components Mounted on Structural Rings
at X_T 1082 and X_T 1034 in Panels 1, 2 and 3 of the
Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/
Cable Tray Installation. Weight of Component \geq
75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
20 - 30 Hz @ +6 dB/oct
30 - 120 Hz @ $0.08 \text{ g}^2/\text{Hz}$
120 - 210 Hz @ +6 dB/oct
210 - 400 Hz @ $0.25 \text{ g}^2/\text{Hz}$
400 - 480 Hz @ +9 dB/oct
480 - 900 Hz @ $0.43 \text{ g}^2/\text{Hz}$
900 - 2000 Hz @ -12 dB/oct
2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $19.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +3 dB/oct
100 - 300 Hz @ $0.055 \text{ g}^2/\text{Hz}$
300 - 500 Hz @ +12 dB/oct
500 - 700 Hz @ $0.38 \text{ g}^2/\text{Hz}$
700 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
20 - 38 Hz @ +9 dB/oct
38 - 350 Hz @ $0.075 \text{ g}^2/\text{Hz}$
350 - 500 Hz @ +10 dB/oct
500 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.04 \text{ g}^2/\text{Hz}$

Composite = $15.6 \text{ g}_{\text{rms}}$

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +10 dB/oct
40 - 200 Hz @ $0.025 \text{ g}^2/\text{Hz}$
200 - 350 Hz @ +9 dB/oct
350 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $11.5 \text{ g}_{\text{rms}}$

3-1-1-2-CP (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

	20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
20 -	30 Hz @ +6 dB/oct
30 -	120 Hz @ $0.32 \text{ g}^2/\text{Hz}$
120 -	210 Hz @ +6 dB/oct
210 -	400 Hz @ $1.0 \text{ g}^2/\text{Hz}$
400 -	480 Hz @ +9 dB/oct
480 -	900 Hz @ $1.7 \text{ g}^2/\text{Hz}$
900 -	2000 Hz @ -12 dB/oct
	2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $39.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

	20 Hz @ $0.044 \text{ g}^2/\text{Hz}$
20 -	100 Hz @ +3 dB/oct
100 -	300 Hz @ $0.22 \text{ g}^2/\text{Hz}$
300 -	500 Hz @ +12 dB/oct
500 -	700 Hz @ $1.5 \text{ g}^2/\text{Hz}$
700 -	2000 Hz @ -9 dB/oct
	2000 Hz @ $0.07 \text{ g}^2/\text{Hz}$

Composite = $31.1 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 -	5 Hz @ 0.6 G's peak*
5 -	40 Hz @ 0.6 G's peak

Lateral Axes

2 -	5 Hz @ 0.8 G's peak*
5 -	40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-2 Structural Ring at Station X_T 985 in Panels 1, 2, and 3 of the ET Intertank (General Specifications)

Same as Subzone 3-1-2-A below.

Subzone 3-1-2-A Input to Components Mounted on Structural Ring at X_T 985 in Panels 1, 2 and 3 of the Intertank, and not within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 340 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 340 - 500 Hz @ +6 dB/oct
 500 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $14.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0028 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 250 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 250 - 450 Hz @ +9 dB/oct
 450 - 700 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.0068 \text{ g}^2/\text{Hz}$

Composite = $10.4 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 20 - 50 Hz @ +9 dB/oct
 50 - 200 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 200 - 240 Hz @ -12 dB/oct
 240 - 800 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $14.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0013 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +10 dB/oct
 60 - 200 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $16.2 \text{ g}_{\text{rms}}$

3-1-2-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.051 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 340 Hz @ $0.45 \text{ g}^2/\text{Hz}$
 340 - 500 Hz @ +6 dB/oct
 500 - 800 Hz @ $1.0 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.096 \text{ g}^2/\text{Hz}$

Composite = $29.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +6 dB/oct
 60 - 250 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 250 - 450 Hz @ +9 dB/oct
 450 - 700 Hz @ $0.6 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.027 \text{ g}^2/\text{Hz}$

Composite = $20.8 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-2-B Input to Components Mounted on Structural Ring at X_T 985 in Panels 1, 2 and 3 of the Intertank, and not within $+10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 30 but < 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 43 - 43 Hz @ +6 dB/oct
 43 - 340 Hz @ $0.058 \text{ g}^2/\text{Hz}$
 340 - 500 Hz @ +6 dB/oct
 500 - 800 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$

Composite = $11.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0028 \text{ g}^2/\text{Hz}$
 43 - 43 Hz @ +6 dB/oct
 43 - 250 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 250 - 450 Hz @ +9 dB/oct
 450 - 700 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.0035 \text{ g}^2/\text{Hz}$

Composite = $7.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 40 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 200 - 240 Hz @ -12 dB/oct
 240 - 800 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$

Composite = $10.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0013 \text{ g}^2/\text{Hz}$
 42 - 42 Hz @ +10 dB/oct
 42 - 200 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $11.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.051 \text{ g}^2/\text{Hz}$
 43 - 43 Hz @ +6 dB/oct
 43 - 340 Hz @ $0.23 \text{ g}^2/\text{Hz}$
 340 - 500 Hz @ +6 dB/oct
 500 - 800 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.048 \text{ g}^2/\text{Hz}$

Composite = $22.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 43 - 43 Hz @ +6 dB/oct
 43 - 250 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 250 - 450 Hz @ +9 dB/oct
 450 - 700 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.014 \text{ g}^2/\text{Hz}$

Composite = $14.4 \text{ g}_{\text{rms}}$

3-1-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-2-C Input to Components Mounted on Structural Ring at X_T 985 In Panels 1, 2 and 3 of the Intertank, and not within $\pm 10^\circ$ of the GO₂ Press. Line/Cable Tray Installation. Weight of Component \geq 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.013 g²/Hz
 30 - 30 Hz @ +6 dB/oct
 30 - 340 Hz @ 0.028 g²/Hz
 340 - 500 Hz @ +6 dB/oct
 500 - 800 Hz @ 0.063 g²/Hz
 800 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.006 g²/Hz

Composite = 7.4 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.0028 g²/Hz
 30 - 30 Hz @ +6 dB/oct
 30 - 250 Hz @ 0.0063 g²/Hz
 250 - 450 Hz @ +9 dB/oct
 450 - 700 Hz @ 0.038 g²/Hz
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0018 g²/Hz

Composite = 5.1 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.019 g²/Hz
 32 - 32 Hz @ +9 dB/oct
 32 - 200 Hz @ 0.075 g²/Hz
 200 - 240 Hz @ -12 dB/oct
 240 - 800 Hz @ 0.038 g²/Hz
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.006 g²/Hz

Composite = 7.4 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.0013 g²/Hz
 30 - 30 Hz @ +10 dB/oct
 30 - 200 Hz @ 0.012 g²/Hz
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ 0.060 g²/Hz
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.010 g²/Hz

Composite = 8.1 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ 0.051 g²/Hz
 30 - 30 Hz @ +6 dB/oct
 30 - 340 Hz @ 0.11 g²/Hz
 340 - 500 Hz @ +6 dB/oct
 500 - 800 Hz @ 0.25 g²/Hz
 800 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.024 g²/Hz

Composite = 14.7 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.011 g²/Hz
 30 - 30 Hz @ +6 dB/oct
 30 - 250 Hz @ 0.025 g²/Hz
 250 - 450 Hz @ +9 dB/oct
 450 - 700 Hz @ 0.15 g²/Hz
 700 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.007 g²/Hz

Composite = 10.2 g_{rms}

3-1-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-2-AP Input to Components Mounted on Structural Ring at \bar{X}_T 985 in Panels 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +6 dB/oct
 120 - 500 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 500 - 600 Hz @ +10 dB/oct
 600 - 1000 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.048 \text{ g}^2/\text{Hz}$

Composite = $27.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0028 \text{ g}^2/\text{Hz}$
 20 - 130 Hz @ +6 dB/oct
 130 - 320 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 320 - 500 Hz @ +9 dB/oct
 500 - 900 Hz @ $0.43 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $18.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 20 - 50 Hz @ +9 dB/oct
 50 - 200 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 200 - 240 Hz @ -12 dB/oct
 240 - 800 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $14.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0013 \text{ g}^2/\text{Hz}$
 20 - 60 Hz @ +10 dB/oct
 60 - 200 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.25 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $16.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.044 \text{ g}^2/\text{Hz}$
 20 - 120 Hz @ +6 dB/oct
 120 - 500 Hz @ $1.6 \text{ g}^2/\text{Hz}$
 500 - 600 Hz @ +10 dB/oct
 600 - 1000 Hz @ $3.0 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.19 \text{ g}^2/\text{Hz}$

Composite = $54.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 130 Hz @ +6 dB/oct
 130 - 320 Hz @ $0.45 \text{ g}^2/\text{Hz}$
 320 - 500 Hz @ +9 dB/oct
 500 - 900 Hz @ $1.7 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.07 \text{ g}^2/\text{Hz}$

Composite = $37.7 \text{ g}_{\text{rms}}$

3-1-2-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-2-BP Input to Components Mounted on Structural Ring at X_T 985 in Panels 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 30 but < 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ $0.011 \text{ g}^2/\text{Hz}$	20 - 20 Hz @ $0.0028 \text{ g}^2/\text{Hz}$
86 - 86 Hz @ +6 dB/oct	94 - 94 Hz @ +6 dB/oct
500 - 500 Hz @ $0.2 \text{ g}^2/\text{Hz}$	320 - 320 Hz @ $0.058 \text{ g}^2/\text{Hz}$
600 - 600 Hz @ +10 dB/oct	500 - 500 Hz @ +9 dB/oct
1000 - 1000 Hz @ $0.38 \text{ g}^2/\text{Hz}$	900 - 900 Hz @ $0.21 \text{ g}^2/\text{Hz}$
2000 - 2000 Hz @ -12 dB/oct	2000 - 2000 Hz @ -12 dB/oct
2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.0088 \text{ g}^2/\text{Hz}$
Composite = $19.4 \text{ g}_{\text{rms}}$	Composite = $13.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ $0.019 \text{ g}^2/\text{Hz}$	20 - 20 Hz @ $0.0013 \text{ g}^2/\text{Hz}$
40 - 40 Hz @ +9 dB/oct	42 - 42 Hz @ +10 dB/oct
200 - 200 Hz @ $0.15 \text{ g}^2/\text{Hz}$	200 - 200 Hz @ $0.025 \text{ g}^2/\text{Hz}$
240 - 240 Hz @ -12 dB/oct	350 - 350 Hz @ +9 dB/oct
800 - 800 Hz @ $0.075 \text{ g}^2/\text{Hz}$	800 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
2000 - 2000 Hz @ -6 dB/oct	2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$
Composite = $10.4 \text{ g}_{\text{rms}}$	Composite = $11.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ $0.044 \text{ g}^2/\text{Hz}$	20 - 20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
86 - 86 Hz @ +6 dB/oct	94 - 94 Hz @ +6 dB/oct
500 - 500 Hz @ $0.8 \text{ g}^2/\text{Hz}$	320 - 320 Hz @ $0.23 \text{ g}^2/\text{Hz}$
600 - 600 Hz @ +10 dB/oct	500 - 500 Hz @ +9 dB/oct
1000 - 1000 Hz @ $1.5 \text{ g}^2/\text{Hz}$	900 - 900 Hz @ $0.85 \text{ g}^2/\text{Hz}$
2000 - 2000 Hz @ -12 dB/oct	2000 - 2000 Hz @ -12 dB/oct
2000 Hz @ $0.095 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.035 \text{ g}^2/\text{Hz}$
Composite = $38.8 \text{ g}_{\text{rms}}$	Composite = $26.4 \text{ g}_{\text{rms}}$

3-1-2-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-1-2-CP Input to Components Mounted on Structural Ring at X_T 985 in Panels 1, 2 and 3 of the Intertank, and within $\pm 10^\circ$ of the GO₂ Press. Line/Cable Tray Installation. Weight of Component ≥ 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 62 Hz @ +6 dB/oct
 62 - 500 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 500 - 600 Hz @ +10 dB/oct
 600 - 1000 Hz @ $0.19 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$

Composite = $13.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0028 \text{ g}^2/\text{Hz}$
 20 - 64 Hz @ +6 dB/oct
 64 - 320 Hz @ $0.028 \text{ g}^2/\text{Hz}$
 320 - 500 Hz @ +9 dB/oct
 500 - 900 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.0045 \text{ g}^2/\text{Hz}$

Composite = $9.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 20 - 32 Hz @ +9 dB/oct
 32 - 200 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 200 - 240 Hz @ -12 dB/oct
 240 - 800 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.006 \text{ g}^2/\text{Hz}$

Composite = $7.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0013 \text{ g}^2/\text{Hz}$
 20 - 30 Hz @ +10 dB/oct
 30 - 200 Hz @ $0.012 \text{ g}^2/\text{Hz}$
 200 - 350 Hz @ +9 dB/oct
 350 - 800 Hz @ $0.060 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.010 \text{ g}^2/\text{Hz}$

Composite = $8.1 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.044 \text{ g}^2/\text{Hz}$
 20 - 62 Hz @ +6 dB/oct
 62 - 500 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 500 - 600 Hz @ +10 dB/oct
 600 - 1000 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.048 \text{ g}^2/\text{Hz}$

Composite = $27.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 20 - 64 Hz @ +6 dB/oct
 64 - 320 Hz @ $0.11 \text{ g}^2/\text{Hz}$
 320 - 500 Hz @ +9 dB/oct
 500 - 900 Hz @ $0.43 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -12 dB/oct
 2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $19.0 \text{ g}_{\text{rms}}$

3-1-2-CP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2 ET Intertank (Stations X_T 1130 to X_T 852) Panels
4 and 5. (General Specifications)

Same as Subzone 3-2-1-A below.

Subzone 3-2-1 Structural Rings at Stations X_T 1082, X_T 1034, X_T
941, and X_T 897 in Panels 4 and 5 of the ET Intertank.
(General Specifications)

Same as Subzone 3-2-1-A below.

Subzone 3-2-1-A Input to Components Mounted on Structural Rings at
Stations X_T 1082, X_T 1034, X_T 941 and X_T 897, in
Panels 4 and 5 of the ET Intertank. Weight of
Components < 50 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.048 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +9 dB/oct
50 - 200 Hz @ $0.75 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $21.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.075 \text{ g}^2/\text{Hz}$
20 - 30 Hz @ +6 dB/oct
30 - 200 Hz @ $0.17 \text{ g}^2/\text{Hz}$
200 - 400 Hz @ +10 dB/oct
400 - 800 Hz @ $1.75 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.082 \text{ g}^2/\text{Hz}$

Composite = $37.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.009 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +9 dB/oct
50 - 200 Hz @ $0.15 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $9.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0011 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +9 dB/oct
60 - 230 Hz @ $0.029 \text{ g}^2/\text{Hz}$
230 - 360 Hz @ +10 dB/oct
360 - 2000 Hz @ $0.12 \text{ g}^2/\text{Hz}$

Composite = $14.8 \text{ g}_{\text{rms}}$

3-2-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.19 \text{ g}^2/\text{Hz}$
50 Hz @ +9 dB/oct
50 - 200 Hz @ $3.0 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.3 \text{ g}^2/\text{Hz}$

Composite = $43.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.31 \text{ g}^2/\text{Hz}$
30 Hz @ +6 dB/oct
30 - 200 Hz @ $0.70 \text{ g}^2/\text{Hz}$
200 - 400 Hz @ +10 dB/oct
400 - 800 Hz @ $7.00 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.33 \text{ g}^2/\text{Hz}$

Composite = $75.3 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2-1-B Input to Components Mounted on Structural Rings at Stations X_t 1082, X_t 1034, X_t 941 and X_t 897, in Panels 4 and 5 of the ET Intertank. Weight of Component ≥ 50 but < 150 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.048 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $0.38 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.038 \text{ g}^2/\text{Hz}$

Composite = $15.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 200 Hz @ $0.087 \text{ g}^2/\text{Hz}$
 200 - 400 Hz @ +10 dB/oct
 400 - 800 Hz @ $0.87 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.042 \text{ g}^2/\text{Hz}$

Composite = $26.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0096 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$

Composite = $6.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0010 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +9 dB/oct
 48 - 230 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 230 - 360 Hz @ +10 dB/oct
 360 - 2000 Hz @ $0.062 \text{ g}^2/\text{Hz}$

Composite = $10.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.19 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $1.5 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.15 \text{ g}^2/\text{Hz}$

Composite = $30.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 200 Hz @ $0.35 \text{ g}^2/\text{Hz}$
 200 - 400 Hz @ +10 dB/oct
 400 - 800 Hz @ $3.50 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.17 \text{ g}^2/\text{Hz}$

Composite = $53.2 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

3-2-1-B (Cont.)

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2-1-C Input to Components Mounted on Structural Rings at Stations X_t 1082, X_t 1034, X_t 941 and X_t 897, in Panels 4 and 5 of the ET Intertank. Weight of Components \geq 150 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.048 \text{ g}^2/\text{Hz}$	20 - 200 Hz @ $0.045 \text{ g}^2/\text{Hz}$
20 - 32 Hz @ +9 dB/oct	200 - 400 Hz @ +10 dB/oct
32 - 200 Hz @ $0.19 \text{ g}^2/\text{Hz}$	400 - 800 Hz @ $0.44 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct	800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.021 \text{ g}^2/\text{Hz}$
Composite = $10.9 \text{ g}_{\text{rms}}$	Composite = $18.8 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0096 \text{ g}^2/\text{Hz}$	20 Hz @ $0.0010 \text{ g}^2/\text{Hz}$
20 - 32 Hz @ +9 dB/oct	20 - 38 Hz @ +9 dB/oct
32 - 200 Hz @ $0.038 \text{ g}^2/\text{Hz}$	38 - 230 Hz @ $0.0075 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct	230 - 360 Hz @ +10 dB/oct
2000 Hz @ $0.0038 \text{ g}^2/\text{Hz}$	360 - 2000 Hz @ $0.031 \text{ g}^2/\text{Hz}$
Composite = $4.9 \text{ g}_{\text{rms}}$	Composite = $7.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.19 \text{ g}^2/\text{Hz}$	20 - 200 Hz @ $0.18 \text{ g}^2/\text{Hz}$
20 - 32 Hz @ +9 dB/oct	200 - 400 Hz @ +10 dB/oct
32 - 200 Hz @ $0.75 \text{ g}^2/\text{Hz}$	400 - 800 Hz @ $1.75 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct	800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.083 \text{ g}^2/\text{Hz}$
Composite = $21.8 \text{ g}_{\text{rms}}$	Composite = $37.7 \text{ g}_{\text{rms}}$

3-2-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2-2 Structural Ring at Station X_t 985 in Panels 4 and 5 of the ET Intertank. (General Specifications)

Same as Subzone 3-2-2-A below.

Subzone 3-2-2-A Input to Components Mounted on Structural Ring at Station X_t 985 in Panels 4 and 5 of the ET Intertank.
Weight of Components < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.013 \text{ g}^2/\text{Hz}$	20 - 200 Hz @ $0.045 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +9 dB/oct	200 - 400 Hz @ +10 dB/oct
50 - 200 Hz @ $0.20 \text{ g}^2/\text{Hz}$	400 - 800 Hz @ $0.45 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct	800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.023 \text{ g}^2/\text{Hz}$
Composite = $11.2 \text{ g}_{\text{rms}}$	Composite = $19.0 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$	20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +9 dB/oct	20 - 60 Hz @ +9 dB/oct
50 - 200 Hz @ $0.04 \text{ g}^2/\text{Hz}$	60 - 230 Hz @ $0.0080 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct	230 - 360 Hz @ +10 dB/oct
2000 Hz @ $0.004 \text{ g}^2/\text{Hz}$	360 - 2000 Hz @ $0.035 \text{ g}^2/\text{Hz}$
Composite = $5.0 \text{ g}_{\text{rms}}$	Composite = $7.9 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.05 \text{ g}^2/\text{Hz}$	20 Hz @ $0.09 \text{ g}^2/\text{Hz}$
20 - 50 Hz @ +9 dB/oct	20 - 30 Hz @ +6 dB/oct
50 - 200 Hz @ $0.8 \text{ g}^2/\text{Hz}$	30 - 200 Hz @ $0.18 \text{ g}^2/\text{Hz}$
200 - 2000 Hz @ -3 dB/oct	200 - 400 Hz @ +10 dB/oct
2000 Hz @ $0.08 \text{ g}^2/\text{Hz}$	400 - 800 Hz @ $1.80 \text{ g}^2/\text{Hz}$
	800 - 2000 Hz @ -10 dB/oct
	2000 Hz @ $0.092 \text{ g}^2/\text{Hz}$
Composite = $22.3 \text{ g}_{\text{rms}}$	Composite = $38.1 \text{ g}_{\text{rms}}$

3-2-2-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2-2-B Input to Components Mounted on Structural Ring at
Station X_t 985 in panels 4 and 5 of the ET Intertank.
 Weight of Components ≥ 75 but < 225 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.01 \text{ g}^2/\text{Hz}$

Composite = $8.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 200 Hz @ $0.022 \text{ g}^2/\text{Hz}$
 200 - 400 Hz @ +10 dB/oct
 400 - 800 Hz @ $0.22 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.011 \text{ g}^2/\text{Hz}$

Composite = $13.4 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $0.02 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.002 \text{ g}^2/\text{Hz}$

Composite = $3.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
 20 - 48 Hz @ +9 dB/oct
 48 - 230 Hz @ $0.0038 \text{ g}^2/\text{Hz}$
 230 - 360 Hz @ +10 dB/oct
 360 - 2000 Hz @ $0.018 \text{ g}^2/\text{Hz}$

Composite = $5.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +9 dB/oct
 40 - 200 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.04 \text{ g}^2/\text{Hz}$

Composite = $16.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 200 Hz @ $0.090 \text{ g}^2/\text{Hz}$
 200 - 400 Hz @ +10 dB/oct
 400 - 800 Hz @ $0.90 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.046 \text{ g}^2/\text{Hz}$

Composite = $26.8 \text{ g}_{\text{rms}}$

3-2-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axis

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2-2-C Input to Components Mounted on Strcutural Ring at
Station X_t 985 in Panels 4 and 5 of the ET Intertank
 Weight of Components \geq 225 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.013 g^2/Hz
 20 - 32 Hz @ +9 dB/oct
 32 - 200 Hz @ 0.05 g^2/Hz
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.005 g^2/Hz

Composite = 5.7 g_{rms}

Long. and Tang. Axes

20 - 200 Hz @ 0.011 g^2/Hz
 200 - 400 Hz @ +10 dB/oct
 400 - 800 Hz @ 0.11 g^2/Hz
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ 0.0057 g^2/Hz

Composite = 9.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.0026 g^2/Hz
 20 - 32 Hz @ +9 dB/oct
 32 - 200 Hz @ 0.01 g^2/Hz
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.001 g^2/Hz

Composite = 2.5 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00030 g^2/Hz
 20 - 38 Hz @ +9 dB/oct
 38 - 230 Hz @ 0.0032 g^2/Hz
 230 - 360 Hz @ +10 dB/oct
 360 - 2000 Hz @ 0.014 g^2/Hz

Composite = 5.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ 0.05 g^2/Hz
 20 - 32 Hz @ +9 dB/oct
 32 - 200 Hz @ 0.2 g^2/Hz
 200 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.02 g^2/Hz

Composite = 11.3 g_{rms}

Long. and Tang. Axes

20 - 200 Hz @ 0.045 g^2/Hz
 200 - 400 Hz @ +10 dB/oct
 400 - 800 Hz @ 0.45 g^2/Hz
 800 - 2000 Hz @ -10 dB/oct
 2000 Hz @ 0.023 g^2/Hz

Composite = 19.0 g_{rms}

3-2-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-2-3 SRB Beam at Station X_T 985 of the ET Intertank.
(General Specifications)

Same as Subzone 3-2-3-A below.

Subzone 3-2-3-A Input to Components Mounted on the SRB Beam at
Station X_T 985 of the ET Intertank.

1. Acceptance Test Criteria (1 min/axis)

X_t and Z_t Axes

20 Hz @ $0.0089 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +10 dB/oct
40 - 800 Hz @ $0.089 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.0040 \text{ g}^2/\text{Hz}$

Composite = $9.7 \text{ g}_{\text{rms}}$

Y_t Axis

20 Hz @ $0.0035 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +6 dB/oct
65 - 330 Hz @ $0.035 \text{ g}^2/\text{Hz}$
330 - 500 Hz @ +9 dB/oct
500 - 800 Hz @ $0.12 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.0060 \text{ g}^2/\text{Hz}$

Composite = $9.8 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

X_t and Z_t Axes

20 Hz @ $0.00077 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +9 dB/oct
65 - 160 Hz @ $0.026 \text{ g}^2/\text{Hz}$
160 - 360 Hz @ -3 dB/oct
360 - 2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$

Composite = $5.0 \text{ g}_{\text{rms}}$

Y_t Axis

20 Hz @ $0.00064 \text{ g}^2/\text{Hz}$
20 - 120 Hz @ +4 dB/oct
120 - 330 Hz @ $0.0066 \text{ g}^2/\text{Hz}$
330 - 500 Hz @ +10 dB/oct
500 - 800 Hz @ $0.027 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0043 \text{ g}^2/\text{Hz}$

Composite = $5.0 \text{ g}_{\text{rms}}$

3-2-3-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

X_t and Z_t Axes

20 Hz @ $0.035 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +10 dB/oct
40 - 800 Hz @ $0.35 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.016 \text{ g}^2/\text{Hz}$

Composite = $19.4 \text{ g}_{\text{rms}}$

Y_t Axis

20 Hz @ $0.014 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +6 dB/oct
65 - 330 Hz @ $0.14 \text{ g}^2/\text{Hz}$
330 - 500 Hz @ +9 dB/oct
500 - 800 Hz @ $0.50 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $19.7 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-3 ET Intertank (Stations X_t 1130 to X_t 852), Panels 6, 7, and 8 (General Specifications)

Same as Subzone 3-3-1-A below.

Subzone 3-3-1 Structural Rings at Stations X_t 1082, X_t 1034 (Partial), X_t 941, and X_t 897 in Panels 6, 7, and 8 of the ET Intertank (General Specifications)

Same as Subzone 3-3-1-A below.

Subzone 3-3-1-A Input to Components Mounted on Structural Rings at Stations X_t 1082, X_t 1034 (Partial), X_t 941 and X_t 897 in Panels 6, 7, and 8 of the ET Intertank. Weight of Component < 25 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.024 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +12 dB/oct
40 - 100 Hz @ $0.38 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct
125 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $14.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +3 dB/oct
40 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $10.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.095 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +12 dB/oct
40 - 100 Hz @ $1.5 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct
125 - 1000 Hz @ $0.6 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $29.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +3 dB/oct
40 - 1000 Hz @ $0.3 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $21.0 \text{ g}_{\text{rms}}$

3-3-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 20 Hz @ $0.075 \text{ g}^2/\text{Hz}$
40 - 40 Hz @ +12 dB/oct
40 - 100 Hz @ $1.2 \text{ g}^2/\text{Hz}$
100 - 130 Hz @ -12 dB/oct
130 - 1000 Hz @ $0.42 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -4 dB/oct
2000 Hz @ $0.17 \text{ g}^2/\text{Hz}$

Composite = $26.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.08 \text{ g}^2/\text{Hz}$
60 - 60 Hz @ +3 dB/oct
60 - 1000 Hz @ $0.24 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $17.7 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's Peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria

See Table I

* Design Criteria Only

Subzone 3-3-1-B Input to Components Mounted on Structural Rings at Stations X_t 1082, X_t 1034 (Partial), X_t 941 and X_t 897 on Panels 6, 7, and 8 of the ET Intertank. Weight of Component ≥ 25 but < 75 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 20 - 28 Hz @ +12 dB/oct
 28 - 100 Hz @ $0.19 \text{ g}^2/\text{Hz}$
 100 - 125 Hz @ -12 dB/oct
 125 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.0095 \text{ g}^2/\text{Hz}$

Composite = $10.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0095 \text{ g}^2/\text{Hz}$

Composite = $11.4 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.20 \text{ g}^2/\text{Hz}$
 20 - 28 Hz @ +12 dB/oct
 28 - 100 Hz @ $0.75 \text{ g}^2/\text{Hz}$
 100 - 125 Hz @ -12 dB/oct
 125 - 1000 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.038 \text{ g}^2/\text{Hz}$

Composite = $21.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 1000 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.038 \text{ g}^2/\text{Hz}$

Composite = $22.7 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.16 \text{ g}^2/\text{Hz}$
 20 - 28 Hz @ +12 dB/oct
 28 - 100 Hz @ $0.6 \text{ g}^2/\text{Hz}$
 100 - 130 Hz @ -12 dB/oct
 130 - 1000 Hz @ $0.21 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -4 dB/oct
 2000 Hz @ $0.085 \text{ g}^2/\text{Hz}$

Composite = $19.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.058 \text{ g}^2/\text{Hz}$
 20 - 42 Hz @ +3 dB/oct
 42 - 1000 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$

Composite = $12.6 \text{ g}_{\text{rms}}$

3-3-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-3-1-C Input to Components Mounted on Structural Rings at Stations X_t 1082, X_t 1034 (Partial), X_t 941, and X_t 897 in Panels 6, 7, and 8 of the ET Intertank. Weight of Component \geq 75 lb. but $<$ 225 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 100 Hz @ $0.095 \text{ g}^2/\text{Hz}$
 100 - 125 Hz @ -12 dB/oct
 125 - 1000 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.0048 \text{ g}^2/\text{Hz}$

Composite = $7.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 1000 Hz @ $0.019 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0048 \text{ g}^2/\text{Hz}$

Composite = $5.3 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 100 Hz @ $0.38 \text{ g}^2/\text{Hz}$
 100 - 125 Hz @ -12 dB/oct
 125 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $15.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $10.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 100 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 100 - 130 Hz @ -12 dB/oct
 130 - 1000 Hz @ $0.115 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -4 dB/oct
 2000 Hz @ $0.043 \text{ g}^2/\text{Hz}$

Composite = $14.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 1000 Hz @ $0.06 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -10 dB/oct
 2000 Hz @ $0.006 \text{ g}^2/\text{Hz}$

Composite = $8.9 \text{ g}_{\text{rms}}$

3-3-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-3-1-D Input to Components Mounted on Structural Rings at Stations X_t 1082, X_t 1034 (Partial), X_t 941, and X_t 897 in Panels 6, 7, and 8 of the ET Intertank. Weight of Component \geq 225 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 100 Hz @ $0.048 \text{ g}^2/\text{Hz}$	20 - 1000 Hz @ $0.0095 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct	1000 - 2000 Hz @ -6 dB/oct
125 - 1000 Hz @ $0.019 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.0024 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.0024 \text{ g}^2/\text{Hz}$	
Composite = $5.3 \text{ g}_{\text{rms}}$	Composite = $3.8 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 100 Hz @ $0.19 \text{ g}^2/\text{Hz}$	20 - 1000 Hz @ $0.038 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct	1000 - 2000 Hz @ -6 dB/oct
125 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.0095 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.0095 \text{ g}^2/\text{Hz}$	
Composite = $10.6 \text{ g}_{\text{rms}}$	Composite = $7.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 100 Hz @ $0.15 \text{ g}^2/\text{Hz}$	20 - 1000 Hz @ $0.03 \text{ g}^2/\text{Hz}$
100 - 130 Hz @ -12 dB/oct	1000 - 2000 Hz @ -10 dB/oct
130 - 1000 Hz @ $0.058 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.0003 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -4 dB/oct	
2000 Hz @ $0.022 \text{ g}^2/\text{Hz}$	
Composite = $10.4 \text{ g}_{\text{rms}}$	Composite = $6.5 \text{ g}_{\text{rms}}$

3-3-1-D (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's Peak*
5 - 40 Hz @ 0.6 G's Peak

Lateral Axes

2 - 5 Hz @ 0.8 G's Peak*
5 - 40 Hz @ 0.8 G's Peak

5. Shock Test Criteria

See Table I

* Design Criteria Only

Subzone 3-3-2 Structural Ring at Station X_t 985 in Panels 6, 7, and 8 of the ET Intertank. (General Specifications)

Same as Subzone 3-3-2-A below.

Subzone 3-3-2-A Input to Components Mounted on the Structural Ring at Station X_t 985 in Panels 6, 7, and 8 of the ET Intertank. Weight of Component < 35 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0078 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +12 dB/oct
 40 - 100 Hz @ $0.13 \text{ g}^2/\text{Hz}$
 100 - 125 Hz @ -12 dB/oct
 125 - 1000 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.0063 \text{ g}^2/\text{Hz}$

Composite = $8.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 1000 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0063 \text{ g}^2/\text{Hz}$

Composite = $6.1 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.031 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +12 dB/oct
 40 - 100 Hz @ $0.5 \text{ g}^2/\text{Hz}$
 100 - 125 Hz @ -12 dB/oct
 125 - 1000 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $17.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 1000 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $12.1 \text{ g}_{\text{rms}}$

3-3-2-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.025 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +12 dB/oct
40 - 100 Hz @ $0.4 \text{ g}^2/\text{Hz}$
100 - 130 Hz @ -12 dB/oct
130 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -4 dB/oct
2000 Hz @ $0.06 \text{ g}^2/\text{Hz}$

Composite = $16.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.027 \text{ g}^2/\text{Hz}$
20 - 60 Hz @ +3 dB/oct
60 - 1100 Hz @ $0.08 \text{ g}^2/\text{Hz}$
1100 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.012 \text{ g}^2/\text{Hz}$

Composite = $10.6 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's Peak*
5 - 40 Hz @ 0.6 G's Peak

Lateral Axes

2 - 5 Hz @ 0.8 G's Peak*
5 - 40 Hz @ 0.8 G's Peak

5. Shock Test Criteria

See Table I

* Design Criteria Only.

Subzone 3-3-2-B Input to Components Mounted on the Structural Ring
at Station X_t 985 in Panels 6, 7, and 8 of the ET
Intertank. Weight of Component ≥ 35 but < 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0076 \text{ g}^2/\text{Hz}$
20 - 34 Hz @ +12 dB/oct
34 - 100 Hz @ $0.063 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct
125 - 1000 Hz @ $0.025 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.0031 \text{ g}^2/\text{Hz}$

Composite = $6.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 1000 Hz @ $0.013 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0031 \text{ g}^2/\text{Hz}$

Composite = $4.3 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.031 \text{ g}^2/\text{Hz}$
20 - 34 Hz @ +12 dB/oct
34 - 100 Hz @ $0.25 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct
125 - 1000 Hz @ $0.1 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.0125 \text{ g}^2/\text{Hz}$

Composite = $12.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 1000 Hz @ $0.05 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0125 \text{ g}^2/\text{Hz}$

Composite = $8.6 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.025 \text{ g}^2/\text{Hz}$
20 - 34 Hz @ +12 dB/oct
34 - 100 Hz @ $0.2 \text{ g}^2/\text{Hz}$
100 - 130 Hz @ -12 dB/oct
130 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -4 dB/oct
2000 Hz @ $0.03 \text{ g}^2/\text{Hz}$

Composite = $11.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.027 \text{ g}^2/\text{Hz}$
20 - 30 Hz @ +3 dB/oct
30 - 1100 Hz @ $0.04 \text{ g}^2/\text{Hz}$
1100 - 2000 Hz @ -10 dB/oct
2000 Hz @ $0.006 \text{ g}^2/\text{Hz}$

Composite = $7.5 \text{ g}_{\text{rms}}$

3-3-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's Peak*
5 - 40 Hz @ 0.6 G's Peak

Lateral Axes

2 - 5 Hz @ 0.8 G's Peak*
5 - 40 Hz @ 0.8 G's Peak

5. Shock Test Criteria

See Table I

* Design Criteria Only

Subzone 3-3-2-C Input to Components Mounted on the Structural Ring
at Station X_t 985 in Panels 6, 7, and 8 of the ET
Intertank. Weight of Component \geq 100 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.0078 \text{ g}^2/\text{Hz}$	20 - 1000 Hz @ $0.0063 \text{ g}^2/\text{Hz}$
20 - 28 Hz @ +12 dB/oct	1000 - 2000 Hz @ -6 dB/oct
28 - 100 Hz @ $0.031 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.0016 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct	
125 - 1000 Hz @ $0.013 \text{ g}^2/\text{Hz}$	
1000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.0016 \text{ g}^2/\text{Hz}$	
Composite = $4.3 \text{ g}_{\text{rms}}$	Composite = $3.1 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.031 \text{ g}^2/\text{Hz}$	20 - 1000 Hz @ $0.025 \text{ g}^2/\text{Hz}$
20 - 28 Hz @ +12 dB/oct	1000 - 2000 Hz @ -6 dB/oct
28 - 100 Hz @ $0.125 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.0063 \text{ g}^2/\text{Hz}$
100 - 125 Hz @ -12 dB/oct	
125 - 1000 Hz @ $0.05 \text{ g}^2/\text{Hz}$	
1000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ $0.0063 \text{ g}^2/\text{Hz}$	
Composite = $8.6 \text{ g}_{\text{rms}}$	Composite = $6.1 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ $0.025 \text{ g}^2/\text{Hz}$	20 - 1100 Hz @ $0.02 \text{ g}^2/\text{Hz}$
20 - 28 Hz @ +12 dB/oct	1100 - 2000 Hz @ -10 dB/oct
28 - 100 Hz @ $0.1 \text{ g}^2/\text{Hz}$	2000 Hz @ $0.003 \text{ g}^2/\text{Hz}$
100 - 130 Hz @ -12 dB/oct	
130 - 1000 Hz @ $0.038 \text{ g}^2/\text{Hz}$	
1000 - 2000 Hz @ -4 dB/oct	
2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$	
Composite = $8.2 \text{ g}_{\text{rms}}$	Composite = $5.3 \text{ g}_{\text{rms}}$

3-3-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 3-3-3 Structural Ring at Station X_t 1034 Between the -Z Axis and the Access Door of the ET Intertank.
(General Specifications)

Same as Subzone 3-3-3-A below.

Subzone 3-3-3-A Input to Components Mounted on the Structural Ring at Station X_t 1034 between the -Z Axis and the Access Door of the ET Intertank. Weight of Component < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0625 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +9 dB/oct
65 - 90 Hz @ $2.0 \text{ g}^2/\text{Hz}$
90 - 123 Hz @ -9 dB/oct
123 - 400 Hz @ $0.7 \text{ g}^2/\text{Hz}$
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0275 \text{ g}^2/\text{Hz}$

Composite = $23.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00065 \text{ g}^2/\text{Hz}$
20 - 95 Hz @ +9 dB/oct
95 - 1300 Hz @ $0.07 \text{ g}^2/\text{Hz}$
1300 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $10.6 \text{ g}_{\text{rms}}$

2 & 3. Flight Random Vibration Criteria (Lift-off and Boost) (3 min/axis)

Radial Axis

20 Hz @ $0.25 \text{ g}^2/\text{Hz}$
20 - 65 Hz @ +9 dB/oct
65 - 90 Hz @ $8.0 \text{ g}^2/\text{Hz}$
90 - 123 Hz @ -9 dB/oct
123 - 400 Hz @ $2.8 \text{ g}^2/\text{Hz}$
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.11 \text{ g}^2/\text{Hz}$

Composite = $46.8 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
20 - 95 Hz @ +9 dB/oct
95 - 1300 Hz @ $0.28 \text{ g}^2/\text{Hz}$
1300 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.076 \text{ g}^2/\text{Hz}$

Composite = $21.2 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria

See Table I

* Design Criteria Only.

Subzone 3-3-3-B Input to Components Mounted on the Structural Ring
at Station X_t 1034 Between the -Z Axis and the Access
Door of the ET Intertank. Weight of Component >
30 but < 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ 0.065 g²/Hz
52 - 52 Hz @ +9 dB/oct
52 - 90 Hz @ 1.0 g²/Hz
90 - 123 Hz @ -9 dB/oct
123 - 480 Hz @ 0.35 g²/Hz
480 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.014 g²/Hz

Composite = 16.8 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.00065
75 - 75 Hz @ +9 dB/oct
75 - 1300 Hz @ 0.035
1300 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.0095

Composite = 7.6 g_{rms}

2 & 3. Flight Random Vibration Criteria (Lift-off and Boost (3 min/axis))

Radial Axis

20 - 20 Hz @ 0.25 g²/Hz
52 - 52 Hz @ +9 dB/oct
52 - 90 Hz @ 4.0 g²/Hz
90 - 123 Hz @ -9 dB/oct
123 - 400 Hz @ 1.4 g²/Hz
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.056 g²/Hz

Composite = 33.7 g_{rms}

Long. and Tang. Axes

20 - 20 Hz @ 0.0026 g²/Hz
75 - 75 Hz @ +9 dB/oct
75 - 1300 Hz @ 0.14 g²/Hz
1300 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.038 g²/Hz

Composite = 15.1 g_{rms}

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria

See Table I

* Design Criteria Only

Subzone 3-3-3-C Input to Components Mounted on the Structural Ring at Station X_t 1034 Between the -Z Axis and the Access Door of the ET Intertank. Weight of Component \geq 90 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ 0.065 g²/Hz
 20 - 40 Hz @ +9 dB/oct
 40 - 90 Hz @ 0.5 g²/Hz
 90 - 123 Hz @ -9 dB/oct
 123 - 400 Hz @ 0.175 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.007 g²/Hz

Composite = 12.1 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00065 g²/Hz
 20 - 60 Hz @ +9 dB/oct
 60 - 1300 Hz @ 0.018 g²/Hz
 1300 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0048 g²/Hz

Composite = 5.3 g_{rms}

2 & 3. Flight Random Vibration Criteria (Lift-off and Boost) (3 min/axis)

Radial Axis

20 Hz @ 0.25 g²/Hz
 20 - 40 Hz @ +9 dB/oct
 40 - 90 Hz @ 2.0 g²/Hz
 90 - 123 Hz @ -9 dB/oct
 123 - 400 Hz @ 0.7 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.028 g²/Hz

Composite = 24.2 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0026 g²/Hz
 20 - 60 Hz @ +9 dB/oct
 60 - 1300 Hz @ 0.07 g²/Hz
 1300 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.019 g²/Hz

Composite = 10.7 g_{rms}

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
 5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria

See Table I

* Design Criteria Only

Subzone 3-4 ET LH₂ Forward Bulkhead (General Specifications)

Same as Subzone 3-4-1-A below.

Subzone 3-4-1 ET LH₂ Forward Bulkhead Gores (Stations X_t 1130 to X_t 1108). (General Specifications)

Same as Subzone 3-4-1-A below.

Subzone 3-4-1-A Input to Components Mounted on the ET LH₂ Forward Bulkhead Gores (Stations X_t 1130 to X_t 1008). Weight of Component < 10 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.0022 g²/Hz
20 - 140 Hz @ +9 dB/oct
140 - 500 Hz @ 0.75 g²/Hz
500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.047 g²/Hz

Composite = 24.0 g_{rms}

Directions B and C

20 Hz @ 0.0050 g²/Hz
20 - 60 Hz @ +3 dB/oct
60 - 220 Hz @ 0.015 g²/Hz
220 - 400 Hz @ +6 dB/oct
400 - 900 Hz @ 0.050 g²/Hz
900 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.0045 g²/Hz

Composite = 7.1 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.0090 g²/Hz
20 - 140 Hz @ +9 dB/oct
140 - 400 Hz @ 2.80 g²/Hz
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.11 g²/Hz

Composite = 41.5 g_{rms}

Directions B and C

20 - 180 Hz @ 0.050 g²/Hz
180 - 400 Hz @ +6 dB/oct
400 - 900 Hz @ 0.25 g²/Hz
900 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.021 g²/Hz

Composite = 16.0 g_{rms}

3-4-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.0090 g^2/Hz
20 - 140 Hz @ +9 dB/oct
140 - 500 Hz @ 3.00 g^2/Hz
500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.19 g^2/Hz

Composite = 48.1 g_{rms}

Directions B and C

20 Hz @ 0.020 g^2/Hz
20 - 60 Hz @ +3 dB/oct
60 - 220 Hz @ 0.060 g^2/Hz
220 - 400 Hz @ +6 dB/oct
400 - 900 Hz @ 0.20 g^2/Hz
900 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.018 g^2/Hz

Composite = 14.2 g_{rms}

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A - Perpendicular to Bulkhead

Direction B - Tangential to Bulkhead

Direction C - Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-4-1-B Input to Components Mounted on the ET LH₂ Forward Bulkhead Gores (Stations X_t 1130 to X_t 1008). Weight of Component ≥ 10 but < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.0022 g²/Hz
 20 - 112 Hz @ +9 dB/oct
 112 - 500 Hz @ 0.37 g²/Hz
 500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.024 g²/Hz

Composite = 17.6 g_{rms}

Directions B and C

20 Hz @ 0.0032 g²/Hz
 20 - 48 Hz @ +3 dB/oct
 48 - 220 Hz @ 0.0075 g²/Hz
 220 - 400 Hz @ +6 dB/oct
 400 - 900 Hz @ 0.025 g²/Hz
 900 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0023 g²/Hz

Composite = 5.0 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.0090 g²/Hz
 20 - 110 Hz @ +9 dB/oct
 110 - 400 Hz @ 1.40 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.055 g²/Hz

Composite = 29.9 g_{rms}

Directions B and C

20 - 180 Hz @ 0.025 g²/Hz
 180 - 400 Hz @ +6 dB/oct
 400 - 900 Hz @ 0.12 g²/Hz
 900 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.011 g²/Hz

Composite = 11.3 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.0090 g²/Hz
 20 - 112 Hz @ +9 dB/oct
 112 - 500 Hz @ 1.50 g²/Hz
 500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.095 g²/Hz

Composite = 35.2 g_{rms}

Directions B and C

20 Hz @ 0.013 g²/Hz
 20 - 48 Hz @ +3 dB/oct
 48 - 220 Hz @ 0.030 g²/Hz
 220 - 400 Hz @ +6 dB/oct
 400 - 900 Hz @ 0.10 g²/Hz
 900 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0092 g²/Hz

Composite = 10.1 g_{rms}

3-4-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-4-1-C Input to Components Mounted on the ET LH₂ Forward Bulkhead Gores (Stations X_t 1130 to X_t 1008). Weight of Components \geq 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.0022 g²/Hz
 88 - 88 Hz @ +9 dB/oct
 500 - 500 Hz @ 0.19 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.012 g²/Hz

Composite = 12.3 g_{rms}

Directions B and C

20 - 20 Hz @ 0.0019 g²/Hz
 38 - 38 Hz @ +3 dB/oct
 220 - 220 Hz @ 0.0037 g²/Hz
 400 - 400 Hz @ +6 dB/oct
 900 - 900 Hz @ 0.012 g²/Hz
 2000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0011 g²/Hz

Composite = 3.6 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.0090 g²/Hz
 87 - 87 Hz @ +9 dB/oct
 400 - 400 Hz @ 0.70 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0027 g²/Hz

Composite = 21.1 g_{rms}

Directions B and C

180 - 180 Hz @ 0.012 g²/Hz
 400 - 400 Hz @ +6 dB/oct
 900 - 900 Hz @ 0.060 g²/Hz
 2000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.011 g²/Hz

Composite = 8.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 - 20 Hz @ 0.0090 g²/Hz
 88 - 88 Hz @ +9 dB/oct
 500 - 500 Hz @ 0.75 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.047 g²/Hz

Composite = 24.7 g_{rms}

Directions B and C

20 - 20 Hz @ 0.0079 g²/Hz
 38 - 38 Hz @ +3 dB/oct
 220 - 220 Hz @ 0.015 g²/Hz
 400 - 400 Hz @ +6 dB/oct
 900 - 900 Hz @ 0.050 g²/Hz
 2000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0046 g²/Hz

Composite = 7.2 g_{rms}

3-4-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-4-2 ET LH₂ Forward Bulkhead Cap (Station X_t 1008).
(General Specifications)

Same as Subzone 3-4-2-A below.

Subzone 3-4-2-A Input to Components Mounted on the ET LH₂ Forward Bulkhead Cap (Station X_t 1008). Weight of Component < 20 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.00078 g²/Hz
20 - 120 Hz @ +10 dB/oct
120 - 400 Hz @ 0.30 g²/Hz
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.012 g²/Hz

Composite = 13.7 g_{rms}

Directions B and C

20 Hz @ 0.0073 g²/Hz
20 - 70 Hz @ +3 dB/oct
70 - 100 Hz @ 0.023 g²/Hz
100 - 126 Hz @ -12 dB/oct
126 - 1000 Hz @ 0.01 g²/Hz
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.0013 g²/Hz

Composite = 3.8 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.0050 g²/Hz
20 - 140 Hz @ +9 dB/oct
140 - 400 Hz @ 1.20 g²/Hz
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.045 g²/Hz

Composite = 27.3 g_{rms}

Directions B and C

20 Hz @ 0.029 g²/Hz
20 - 70 Hz @ +3 dB/oct
70 - 100 Hz @ 0.1 g²/Hz
100 - 126 Hz @ -12 dB/oct
126 - 1000 Hz @ 0.04 g²/Hz
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ 0.005 g²/Hz

Composite = 7.6 g_{rms}

3.4-2-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.0031 \text{ g}^2/\text{Hz}$
20 - 120 Hz @ +10 dB/oct
120 - 400 Hz @ $1.20 \text{ g}^2/\text{Hz}$
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.049 \text{ g}^2/\text{Hz}$

Composite = $27.5 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.029 \text{ g}^2/\text{Hz}$
20 - 70 Hz @ +3 dB/oct
70 - 100 Hz @ $0.1 \text{ g}^2/\text{Hz}$
100 - 126 Hz @ -12 dB/oct
126 - 1000 Hz @ $0.04 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.005 \text{ g}^2/\text{Hz}$

Composite = $7.6 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A - Perpendicular to Bulkhead

Direction B - Tangential to Bulkhead

Direction C - Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-4-2-B Input to Components Mounted on the ET LH₂ Forward Bulkhead Cap (Station X_t 1008). Weight of Component ≥ 20 but < 60 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.00078 g²/Hz
 20 - 98 Hz @ +10 dB/oct
 98 - 400 Hz @ 0.15 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0060 g²/Hz

Composite = 9.8 g_{rms}

Directions B and C

20 Hz @ 0.005 g²/Hz
 20 - 50 Hz @ +3 dB/oct
 50 - 100 Hz @ 0.013 g²/Hz
 100 - 126 Hz @ -12 dB/oct
 126 - 1000 Hz @ 0.005 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.00063 g²/Hz

Composite = 2.7 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.0050 g²/Hz
 20 - 110 Hz @ +9 dB/oct
 110 - 400 Hz @ 0.60 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.023 g²/Hz

Composite = 19.6 g_{rms}

Directions B and C

20 Hz @ 0.02 g²/Hz
 20 - 50 Hz @ +3 dB/oct
 50 - 100 Hz @ 0.05 g²/Hz
 100 - 126 Hz @ -12 dB/oct
 126 - 1000 Hz @ 0.02 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0025 g²/Hz

Composite = 5.4 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.0031 g²/Hz
 20 - 98 Hz @ +10 dB/oct
 98 - 400 Hz @ 0.60 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.024 g²/Hz

Composite = 19.7 g_{rms}

Directions B and C

20 Hz @ 0.02 g²/Hz
 20 - 50 Hz @ +3 dB/oct
 50 - 100 Hz @ 0.05 g²/Hz
 100 - 126 Hz @ -12 dB/oct
 126 - 1000 Hz @ 0.02 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0025 g²/Hz

Composite = 5.4 g_{rms}

3-4-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A - Perpendicular to Bulkhead

Direction B - Tangential to Bulkhead

Direction C - Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-4-2-C Input to Components Mounted on the ET LH₂ Forward Bulkhead Cap (Station X_t 1008). Weight of Component ≥ 60 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.00078 g²/Hz
 80 Hz @ +10 dB/oct
 80 - 400 Hz @ 0.075 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0030 g²/Hz

Composite = 7.2 g_{rms}

Directions B and C

20 - 20 Hz @ 0.0035 g²/Hz
 35 Hz @ +3 dB/oct
 35 - 100 Hz @ 0.0063 g²/Hz
 100 - 126 Hz @ -12 dB/oct
 126 - 1000 Hz @ 0.0025 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.00033 g²/Hz

Composite = 1.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.0050 g²/Hz
 90 Hz @ +9 dB/oct
 90 - 400 Hz @ 0.30 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.012 g²/Hz

Composite = 14.0 g_{rms}

Directions B and C

20 - 20 Hz @ 0.014 g²/Hz
 35 Hz @ +3 dB/oct
 35 - 100 Hz @ 0.025 g²/Hz
 100 - 126 Hz @ -12 dB/oct
 126 - 1000 Hz @ 0.01 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0013 g²/Hz

Composite = 3.8 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 - 20 Hz @ 0.0031 g²/Hz
 80 Hz @ +10 dB/oct
 80 - 400 Hz @ 0.30 g²/Hz
 400 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.012 g²/Hz

Composite = 14.4 g_{rms}

Directions B and C

20 - 20 Hz @ 0.014 g²/Hz
 35 Hz @ +3 dB/oct
 35 - 100 Hz @ 0.025 g²/Hz
 100 - 126 Hz @ -12 dB/oct
 126 - 1000 Hz @ 0.01 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0013 g²/Hz

Composite = 3.8 g_{rms}

Subzone 3-4-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-5 ET LO₂ Aft Bulkhead. (General Specifications)

Same as Subzone 3-5-1-A below.

Subzone 3-5-1 ET LO₂ Aft Bulkhead Gores. ((Stations X_t 963 to X_t 854). (General Specifications)

Same as Subzone 3-5-1-A below.

Subzone 3-5-1-A Input to Components Mounted on the ET LO₂ Aft Bulkhead Gores (Stations X_t 963 to X_t 854). Weight of Components < 12 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.0050 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 180 Hz @ 0.12 g²/Hz
180 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0010 g²/Hz

Composite = 5.9 g_{rms}

Directions B and C

20 Hz @ 0.00080 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 410 Hz @ 0.020 g²/Hz
410 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.00085 g²/Hz

Composite = 3.6 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.016 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 240 Hz @ 0.40 g²/Hz
240 - 2000 Hz @ -7 dB/oct
2000 Hz @ 0.0029 g²/Hz

Composite = 11.7 g_{rms}

Directions B and C

20 Hz @ 0.0032 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 410 Hz @ 0.080 g²/Hz
410 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0034 g²/Hz

Composite = 7.3 g_{rms}

3-5-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.020 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 180 Hz @ $0.50 \text{ g}^2/\text{Hz}$
180 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0041 \text{ g}^2/\text{Hz}$

Composite = $11.8 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00040 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +10 dB/oct
100 - 160 Hz @ $0.080 \text{ g}^2/\text{Hz}$
160 - 195 Hz @ -10 dB/oct
195 - 600 Hz @ $0.040 \text{ g}^2/\text{Hz}$
600 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0036 \text{ g}^2/\text{Hz}$

Composite = $6.5 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-5-1-B Input to Components Mounted on the ET LO₂ Aft Bulk-head Gores (Stations X_t 963 to X_t 854). Weight of Components ≥ 12 but < 36 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.0050 g²/Hz
 20 - 71 Hz @ +6 dB/oct
 71 - 180 Hz @ 0.062 g²/Hz
 180 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.00052 g²/Hz

Composite = 4.3 g_{rms}

Directions B and C

20 Hz @ 0.00080 g²/Hz
 20 - 72 Hz @ +6 dB/oct
 72 - 410 Hz @ 0.010 g²/Hz
 410 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.00042 g²/Hz

Composite = 2.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.016 g²/Hz
 20 - 72 Hz @ +6 dB/oct
 72 - 240 Hz @ 0.20 g²/Hz
 240 - 2000 Hz @ -7 dB/oct
 2000 Hz @ 0.0014 g²/Hz

Composite = 8.5 g_{rms}

Directions B and C

20 Hz @ 0.0032 g²/Hz
 20 - 72 Hz @ +6 dB/oct
 72 - 410 Hz @ 0.040 g²/Hz
 410 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0017 g²/Hz

Composite = 5.2 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.020 g²/Hz
 20 - 71 Hz @ +6 dB/oct
 71 - 180 Hz @ 0.25 g²/Hz
 180 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0021 g²/Hz

Composite = 8.6 g_{rms}

Directions B and C

20 Hz @ 0.00024 g²/Hz
 20 - 100 Hz @ +10 dB/oct
 100 - 160 Hz @ 0.048 g²/Hz
 160 - 195 Hz @ -10 dB/oct
 195 - 600 Hz @ 0.024 g²/Hz
 600 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0022 g²/Hz

Composite = 5.0 g_{rms}

3-5-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A - Perpendicular to Bulkhead

Direction B - Tangential to Bulkhead

Direction C - Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-5-1-C Input to Components Mounted on the ET LO₂ Aft Bulkhead Gores (Stations X_t 963 to X_t 854). Weight of Component \geq 36 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.0050 g²/Hz
 50 - 50 Hz @ +6 dB/oct
 180 - 180 Hz @ 0.032 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.00027 g²/Hz

Composite = 3.2 g_{rms}

Directions B and C

20 - 20 Hz @ 0.000060 g²/Hz
 100 - 100 Hz @ +10 dB/oct
 160 - 160 Hz @ 0.012 g²/Hz
 195 - 195 Hz @ -10 dB/oct
 600 - 600 Hz @ 0.0060 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.00055 g²/Hz

Composite = 2.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.016 g²/Hz
 50 - 50 Hz @ +6 dB/oct
 240 - 240 Hz @ 0.10 g²/Hz
 2000 - 2000 Hz @ -7 dB/oct
 2000 Hz @ 0.00072 g²/Hz

Composite = 6.1 g_{rms}

Directions B and C

20 - 20 Hz @ 0.0032 g²/Hz
 70 - 70 Hz @ +6 dB/oct
 410 - 410 Hz @ 0.039 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0015 g²/Hz

Composite = 5.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 - 20 Hz @ 0.020 g²/Hz
 50 - 50 Hz @ +6 dB/oct
 180 - 180 Hz @ 0.13 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0011 g²/Hz

Composite = 6.4 g_{rms}

Directions B and C

20 - 20 Hz @ 0.00024 g²/Hz
 100 - 100 Hz @ +10 dB/oct
 160 - 160 Hz @ 0.048 g²/Hz
 195 - 195 Hz @ -10 dB/oct
 600 - 600 Hz @ 0.024 g²/Hz
 2000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0022 g²/Hz

Composite = 5.0 g_{rms}

3-5-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-5-2 ET LO₂ Aft Bulkhead Cap at Station X_t 854. (General Specifications)

Same as Subzone 3-5-2-A below.

Subzone 3-5-2 A Input to Components Mounted on the ET LO₂ Aft Bulkhead Cap at Station X_t 854. Weight of Components < 50 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ 0.004 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 250 Hz @ 0.1 g²/Hz
250 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0016 g²/Hz

Composite = 6.3 g_{rms}

Directions B and C

20 Hz @ 0.00055 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 410 Hz @ 0.014 g²/Hz
410 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.00060 g²/Hz

Composite = 3.0 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ 0.016 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 250 Hz @ 0.4 g²/Hz
250 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0063 g²/Hz

Composite = 12.7 g_{rms}

Directions B and C

20 Hz @ 0.0022 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 410 Hz @ 0.056 g²/Hz
410 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0024 g²/Hz

Composite = 6.1 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ 0.016 g²/Hz
20 - 100 Hz @ +6 dB/oct
100 - 250 Hz @ 0.4 g²/Hz
250 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0063 g²/Hz

Composite = 12.7 g_{rms}

Directions B and C

20 Hz @ 0.00048 g²/Hz
20 - 100 Hz @ +9 dB/oct
100 - 160 Hz @ 0.060 g²/Hz
160 - 200 Hz @ -9 dB/oct
200 - 500 Hz @ 0.030 g²/Hz
500 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0019 g²/Hz

Composite = 5.2 g_{rms}

3-5-2-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-5-2-B Input to Components Mounted on the ET LO₂ Aft Bulkhead Cap at Station X_t 854. Weight of Components ≥ 50 but < 150 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.004 g²/Hz
 71 Hz @ +6 dB/oct
 71 - 250 Hz @ 0.05 g²/Hz
 250 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.00078 g²/Hz

Composite = 4.5 g_{rms}

Directions B and C

20 - 20 Hz @ 0.00055 g²/Hz
 84 Hz @ +6 dB/oct
 84 - 410 Hz @ 0.0095 g²/Hz
 410 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.00047 g²/Hz

Composite = 2.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.016 g²/Hz
 71 Hz @ +6 dB/oct
 71 - 250 Hz @ 0.2 g²/Hz
 250 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0031 g²/Hz

Composite = 9.0 g_{rms}

Directions B and C

20 - 20 Hz @ 0.0022 g²/Hz
 84 Hz @ +6 dB/oct
 84 - 410 Hz @ 0.038 g²/Hz
 410 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0019 g²/Hz

Composite = 5.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 - 20 Hz @ 0.016 g²/Hz
 71 Hz @ +6 dB/oct
 71 - 250 Hz @ 0.2 g²/Hz
 250 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0031 g²/Hz

Composite = 9.0 g_{rms}

Directions B and C

20 - 20 Hz @ 0.00044 g²/Hz
 100 Hz @ +9 dB/oct
 100 - 160 Hz @ 0.055 g²/Hz
 160 - 200 Hz @ -9 dB/oct
 200 - 500 Hz @ 0.028 g²/Hz
 500 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0018 g²/Hz

Composite = 5.0 g_{rms}

3-5-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A - Perpendicular to Bulkhead

Direction B - Tangential to Bulkhead

Direction C - Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 3-5-2-C Input to Components Mounted on the ET LO₂ Aft
Bulkhead Cap (Station X_t 854). Weight of Component
≥ 150 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.004 g²/Hz
50 - 50 Hz @ +6 dB/oct
250 - 250 Hz @ 0.025 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0004 g²/Hz

Composite = 3.2 g_{rms}

Directions B and C

20 - 20 Hz @ 0.00055 g²/Hz
84 - 84 Hz @ +6 dB/oct
410 - 410 Hz @ 0.0095 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.00047 g²/Hz

Composite = 2.5 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ 0.016 g²/Hz
50 - 50 Hz @ +6 dB/oct
250 - 250 Hz @ 0.1 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0016 g²/Hz

Composite = 6.3 g_{rms}

Directions B and C

20 - 20 Hz @ 0.0022 g²/Hz
84 - 84 Hz @ +6 dB/oct
410 - 410 Hz @ 0.038 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0019 g²/Hz

Composite = 5.0 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 - 20 Hz @ 0.016 g²/Hz
50 - 50 Hz @ +6 dB/oct
250 - 250 Hz @ 0.1 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.001 g²/Hz

Composite = 6.3 g_{rms}

Directions B and C

20 - 20 Hz @ 0.00044 g²/Hz
100 - 100 Hz @ +9 dB/oct
160 - 160 Hz @ 0.055 g²/Hz
200 - 200 Hz @ -9 dB/oct
500 - 500 Hz @ 0.028 g²/Hz
2000 - 2000 Hz @ -6 dB/oct
2000 Hz @ 0.0018 g²/Hz

Composite = 5.0 g_{rms}

3-5-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

Direction A — Perpendicular to Bulkhead

Direction B — Tangential to Bulkhead

Direction C — Tangential to Bulkhead, Perpendicular to Direction B

* Design Criteria Only

Subzone 4-1 ET LO₂ Cylinder (Stations X_T 852 to X_T 747) and not within $\pm 10^\circ$ of the GO₂ Pressure Line/Cable Tray Installation. (General Specifications)

Same as Subzone 4-1-A below

Subzone 4-1-A Input to Components Mounted on the ET LO Cylinder (Stations X_T 852 to X_T 747) and not within $\pm 10^\circ$ of the GO₂ Pressure Line/Cable Tray Installation. Weight of Components < 15 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 40 Hz @ 0.062 g²/Hz
 40 - 400 Hz @ +3 dB/oct
 400 - 700 Hz @ 0.012 g²/Hz
 700 - 1000 Hz @ +3 dB/oct
 1000 - 2000 Hz @ 0.22 g²/Hz
 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.056 g²/Hz

Composite = 16.7 g_{rms}

Long. and Tang. Axes

20 - 100 Hz @ 0.00030 g²/Hz
 100 - 260 Hz @ +9 dB/oct
 260 - 700 Hz @ 0.37 g²/Hz
 700 - 1000 Hz @ +3 dB/oct
 1000 - 2000 Hz @ 0.10 g²/Hz
 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.05 g²/Hz

Composite = 11.9 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ 0.12 g²/Hz
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.030 g²/Hz

Composite = 13.3 g_{rms}

Long. and Tang. Axes

20 - 100 Hz @ 0.0016 g²/Hz
 100 - 550 Hz @ +6 dB/oct
 550 - 700 Hz @ 0.040 g²/Hz
 700 - 1000 Hz @ +9 dB/oct
 1000 - 2000 Hz @ 0.080 g²/Hz
 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.040 g²/Hz

Composite = 10.4 g_{rms}

4-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.25 \text{ g}^2/\text{Hz}$
20 - 40 Hz @ +3 dB/oct
40 - 400 Hz @ $0.50 \text{ g}^2/\text{Hz}$
400 - 700 Hz @ +3 dB/oct
700 - 1000 Hz @ $0.90 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.23 \text{ g}^2/\text{Hz}$

Composite = $33.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0012 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +9 dB/oct
100 - 260 Hz @ $0.15 \text{ g}^2/\text{Hz}$
260 - 700 Hz @ +3 dB/oct
700 - 1000 Hz @ $0.42 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.21 \text{ g}^2/\text{Hz}$

Composite = $23.8 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 4-1-B Input to Components Mounted on the ET LO₂ Cylinder
(Stations X_T 852 to X_T 747) and not within $\pm 10^\circ$ of the
GO₂ Pressure Line/Cable Tray Installation. Weight of
Components ≥ 15 but < 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 40 Hz @ 0.032 g ² /Hz	20 - 80 Hz @ 0.00030 g ² /Hz
40 - 400 Hz @ 0.062 g ² /Hz	80 - 260 Hz @ 0.019 g ² /Hz
400 - 700 Hz @ +3 dB/oct	260 - 700 Hz @ +3 dB/oct
700 - 1000 Hz @ 0.11 g ² /Hz	700 - 1000 Hz @ 0.050 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.030 g ² /Hz	2000 Hz @ 0.037 g ² /Hz
Composite = 11.8 g _{rms}	Composite = 8.4 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 1000 Hz @ 0.060 g ² /Hz	20 - 70 Hz @ 0.0016 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	70 - 550 Hz @ 0.020 g ² /Hz
2000 Hz @ 0.015 g ² /Hz	550 - 700 Hz @ +9 dB/oct
	700 - 1000 Hz @ 0.040 g ² /Hz
	1000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ 0.020 g ² /Hz
Composite = 9.4 g _{rms}	Composite = 7.4 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 40 Hz @ 0.13 g ² /Hz	20 - 80 Hz @ 0.0012 g ² /Hz
40 - 400 Hz @ 0.25 g ² /Hz	80 - 260 Hz @ 0.075 g ² /Hz
400 - 700 Hz @ +3 dB/oct	260 - 700 Hz @ +3 dB/oct
700 - 1000 Hz @ 0.45 g ² /Hz	700 - 1000 Hz @ 0.21 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.12 g ² /Hz	2000 Hz @ 0.11 g ² /Hz
Composite = 23.6 g _{rms}	Composite = 16.9 g _{rms}

4-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis	Lateral Axes
2 - 5 Hz @ 0.6 G's peak*	2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.6 G's peak	5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 4-1-C Input to Components Mounted on the ET LO₂ Cylinder
(Stations X_T 852 and X_T 747) and not within $\pm 10^\circ$ of
the GO₂ Pressure Line/Cable Tray Installation. Weight
of Components ≥ 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.015 g ² /Hz	20 - 20 Hz @ 0.00030 g ² /Hz
40 - 40 Hz @ +3 dB/oct	62 - 62 Hz @ +9 dB/oct
400 - 400 Hz @ 0.030 g ² /Hz	260 - 260 Hz @ 0.0095 g ² /Hz
700 - 700 Hz @ +3 dB/oct	700 - 700 Hz @ +3 dB/oct
1000 - 1000 Hz @ 0.055 g ² /Hz	1000 - 1000 Hz @ 0.025 g ² /Hz
2000 - 2000 Hz @ -6 dB/oct	2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.014 g ² /Hz	2000 Hz @ 0.012 g ² /Hz
Composite = 8.2 g _{rms}	Composite = 5.9 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 1000 Hz @ 0.030 g ² /Hz	20 - 20 Hz @ 0.0016 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	50 - 50 Hz @ +6 dB/oct
2000 Hz @ 0.0075 g ² /Hz	550 - 550 Hz @ 0.010 g ² /Hz
	700 - 700 Hz @ +9 dB/oct
	1000 - 1000 Hz @ 0.020 g ² /Hz
	2000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ 0.010 g ² /Hz
Composite = 6.7 g _{rms}	Composite = 5.2 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.060 g ² /Hz	20 - 20 Hz @ 0.0012 g ² /Hz
40 - 40 Hz @ +3 dB/oct	62 - 62 Hz @ +9 dB/oct
400 - 400 Hz @ 0.12 g ² /Hz	260 - 260 Hz @ 0.038 g ² /Hz
700 - 700 Hz @ +3 dB/oct	700 - 700 Hz @ +3 dB/oct
1000 - 1000 Hz @ 0.22 g ² /Hz	1000 - 1000 Hz @ 0.10 g ² /Hz
2000 - 2000 Hz @ -6 dB/oct	2000 - 2000 Hz @ -3 dB/oct
2000 Hz @ 0.055 g ² /Hz	2000 Hz @ 0.050 g ² /Hz
Composite = 16.4 g _{rms}	Composite = 11.8 g _{rms}

4-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 4-1-AP Input to Components Mounted on the LO₂ Cylinder (X_T 852 to X_T 747) and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Components < 15 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.025 g ² /Hz	20 - 20 Hz @ 0.00010 g ² /Hz
40 - 40 Hz @ +3 dB/oct	150 - 150 Hz @ +10 dB/oct
76 - 76 Hz @ 0.05 g ² /Hz	1000 - 1000 Hz @ 0.08 g ² /Hz
150 - 150 Hz @ +6 dB/oct	2000 - 2000 Hz @ -6 dB/oct
1000 - 1000 Hz @ 0.2 g ² /Hz	2000 Hz @ 0.02 g ² /Hz
2000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ 0.025 g ² /Hz	
Composite = 16.0 g _{rms}	Composite = 10.5 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 1000 Hz @ 0.12 g ² /Hz	20 - 20 Hz @ 0.0016 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	100 - 100 Hz @ +6 dB/oct
2000 Hz @ 0.030 g ² /Hz	550 - 550 Hz @ 0.040 g ² /Hz
	700 - 700 Hz @ +9 dB/oct
	1000 - 1000 Hz @ 0.080 g ² /Hz
	2000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ 0.040 g ² /Hz
Composite = 13.3 g _{rms}	Composite = 10.4 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 20 Hz @ 0.1 g ² /Hz	20 - 20 Hz @ 0.00041 g ² /Hz
40 - 40 Hz @ +3 dB/oct	150 - 150 Hz @ +10 dB/oct
76 - 76 Hz @ 0.2 g ² /Hz	1000 - 1000 Hz @ 0.32 g ² /Hz
150 - 150 Hz @ +6 dB/oct	2000 - 2000 Hz @ -6 dB/oct
1000 - 1000 Hz @ 0.8 g ² /Hz	2000 Hz @ 0.08 g ² /Hz
2000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ 0.1 g ² /Hz	
Composite = 32.0 g _{rms}	Composite = 21.0 g _{rms}

4-1-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 4-1-BP Input to Components Mounted on the LO₂ Cylinder (X_T 852 to X_T 747) and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component ≥ 15 but < 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.018 g ² /Hz	20 Hz @ 0.00010 g ² /Hz
20 - 29 Hz @ +3 dB/oct	20 - 120 Hz @ +10 dB/oct
29 - 76 Hz @ 0.025 g ² /Hz	120 - 1000 Hz @ 0.04 g ² /Hz
76 - 150 Hz @ +6 dB/oct	1000 - 2000 Hz @ -6 dB/oct
150 - 1000 Hz @ 0.1 g ² /Hz	2000 Hz @ 0.01 g ² /Hz
1000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ 0.013 g ² /Hz	
Composite = 11.2 g _{rms}	Composite = 7.5 g _{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 1000 Hz @ 0.060 g ² /Hz	20 Hz @ 0.0016 g ² /Hz
1000 - 2000 Hz @ -6 dB/oct	20 - 70 Hz @ +6 dB/oct
2000 Hz @ 0.015 g ² /Hz	70 - 550 Hz @ 0.020 g ² /Hz
	550 - 700 Hz @ +9 dB/oct
	700 - 1000 Hz @ 0.040 g ² /Hz
	1000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ 0.020 g ² /Hz
Composite = 9.4 g _{rms}	Composite = 7.4 g _{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 Hz @ 0.07 g ² /Hz	20 Hz @ 0.00041 g ² /Hz
20 - 29 Hz @ +3 dB/oct	20 - 120 Hz @ +10 dB/oct
29 - 76 Hz @ 0.1 g ² /Hz	120 - 1000 Hz @ 0.16 g ² /Hz
76 - 150 Hz @ +6 dB/oct	1000 - 2000 Hz @ -6 dB/oct
150 - 1000 Hz @ 0.4 g ² /Hz	2000 Hz @ 0.04 g ² /Hz
1000 - 2000 Hz @ -9 dB/oct	
2000 Hz @ 0.05 g ² /Hz	
Composite = 22.4 g _{rms}	Composite = 15.0 g _{rms}

4-1-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 4-1-CP Input to Components Mounted on the LO₂ Cylinder (X_T 852 to X_T 747) and within ±10° of the GO₂ Press. Line/Cable Tray Installation. Weight of Component ≥ 45 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 76 Hz @ 0.013 g²/Hz
 76 - 150 Hz @ +6 dB/oct
 150 - 1000 Hz @ 0.05 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.0063 g²/Hz

Composite = 8.0 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00010 g²/Hz
 20 - 100 Hz @ +10 dB/oct
 100 - 1000 Hz @ 0.02 g²/Hz
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.005 g²/Hz

Composite = 5.4 g_{rms}

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ 0.030 g²/Hz
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.0075 g²/Hz

Composite = 6.7 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.0016 g²/Hz
 20 - 50 Hz @ +6 dB/oct
 50 - 550 Hz @ 0.010 g²/Hz
 550 - 700 Hz @ +9 dB/oct
 700 - 1000 Hz @ 0.020 g²/Hz
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ 0.010 g²/Hz

Composite = 5.2 g_{rms}

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 76 Hz @ 0.05 g²/Hz
 76 - 150 Hz @ +6 dB/oct
 150 - 1000 Hz @ 0.2 g²/Hz
 1000 - 2000 Hz @ -9 dB/oct
 2000 Hz @ 0.025 g²/Hz

Composite = 16.0 g_{rms}

Long. and Tang. Axes

20 Hz @ 0.00041 g²/Hz
 20 - 100 Hz @ +10 dB/oct
 100 - 1000 Hz @ 0.08 g²/Hz
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ 0.02 g²/Hz

Composite = 10.7 g_{rms}

4-1-CA (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-1 ET Ogive, Aft Section (Stations X_T 747 to X_T 537)
and not within $\pm 10^\circ$ of the GO_2 Pressure Line/Cable
Tray Installation (General Specifications)

Same as 5-1-A below

Subzone 5-1-A Input to Components Mounted on the ET Ogive, Aft
Section (Stations X_T 747 to X_T 537) and not within $\pm 10^\circ$
of the GO_2 Pressure Line/Cable Tray Installation. Weight
of Component < 10 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.030 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$

Composite = $6.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00045 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 550 Hz @ $0.011 \text{ g}^2/\text{Hz}$
550 - 700 Hz @ +9 dB/oct
700 - 1000 Hz @ $0.023 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.011 \text{ g}^2/\text{Hz}$

Composite = $5.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.12 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.030 \text{ g}^2/\text{Hz}$

Composite = $13.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0018 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +6 dB/oct
100 - 550 Hz @ $0.046 \text{ g}^2/\text{Hz}$
550 - 700 Hz @ +9 dB/oct
700 - 1000 Hz @ $0.092 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.046 \text{ g}^2/\text{Hz}$

Composite = $11.1 \text{ g}_{\text{rms}}$

5-1-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 150 Hz @ $0.030 \text{ g}^2/\text{Hz}$
150 - 600 Hz @ +3 dB/oct
600 - 1000 Hz @ $0.12 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.030 \text{ g}^2/\text{Hz}$

Composite = $12.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.000040 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +10 dB/oct
100 - 160 Hz @ $0.010 \text{ g}^2/\text{Hz}$
160 - 630 Hz @ +4 dB/oct
630 - 1000 Hz @ $0.060 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.030 \text{ g}^2/\text{Hz}$

Composite = $9.0 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-1-B Input to Components Mounted on the ET Ogive, Aft Section (Stations X_T 747 to X_T 537) and not within $\pm 10^\circ$ of the GO_2 Pressure Line/Cable Tray Installation. Weight of Component ≥ 10 but < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0037 \text{ g}^2/\text{Hz}$

Composite = $4.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00045 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +6 dB/oct
 70 - 550 Hz @ $0.0056 \text{ g}^2/\text{Hz}$
 550 - 700 Hz @ +9 dB/oct
 700 - 1000 Hz @ $0.012 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.0056 \text{ g}^2/\text{Hz}$

Composite = $4.0 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.060 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $9.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0018 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +6 dB/oct
 70 - 550 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 550 - 700 Hz @ +9 dB/oct
 700 - 1000 Hz @ $0.046 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.023 \text{ g}^2/\text{Hz}$

Composite = $7.9 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 150 Hz @ $0.015 \text{ g}^2/\text{Hz}$
 150 - 600 Hz @ +3 dB/oct
 600 - 1000 Hz @ $0.060 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $8.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.000040 \text{ g}^2/\text{Hz}$
 20 - 82 Hz @ +10 dB/oct
 82 - 160 Hz @ $0.0050 \text{ g}^2/\text{Hz}$
 160 - 630 Hz @ +4 dB/oct
 630 - 1000 Hz @ $0.030 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $6.4 \text{ g}_{\text{rms}}$

5-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-1-C Input to Components Mounted on the ET Ogive, Aft Section (Stations X_T 747 to X_T 537) and not within $\pm 10^\circ$ of the GO_2 Pressure Line/Cable Tray Installation. Weight of Component ≥ 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 1000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$	20 Hz @ $0.0045 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct	20 - 50 Hz @ +6 dB/oct
2000 Hz @ $0.0018 \text{ g}^2/\text{Hz}$	50 - 550 Hz @ $0.0027 \text{ g}^2/\text{Hz}$
	550 - 700 Hz @ +9 dB/oct
	700 - 1000 Hz @ $0.0056 \text{ g}^2/\text{Hz}$
	1000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ $0.0027 \text{ g}^2/\text{Hz}$
Composite = $3.3 \text{ g}_{\text{rms}}$	Composite = $2.7 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 1000 Hz @ $0.030 \text{ g}^2/\text{Hz}$	20 Hz @ $0.0018 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct	20 - 50 Hz @ +6 dB/oct
2000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$	50 - 550 Hz @ $0.011 \text{ g}^2/\text{Hz}$
	550 - 700 Hz @ +9 dB/oct
	700 - 1000 Hz @ $0.023 \text{ g}^2/\text{Hz}$
	1000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ $0.011 \text{ g}^2/\text{Hz}$
Composite = $6.7 \text{ g}_{\text{rms}}$	Composite = $5.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis	Long. and Tang. Axes
20 - 150 Hz @ $0.0075 \text{ g}^2/\text{Hz}$	20 Hz @ $0.000040 \text{ g}^2/\text{Hz}$
150 - 600 Hz @ +3 dB/oct	20 - 68 Hz @ +10 dB/oct
600 - 1000 Hz @ $0.030 \text{ g}^2/\text{Hz}$	68 - 160 Hz @ $0.0031 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -6 dB/oct	160 - 630 Hz @ +4 dB/oct
2000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$	630 - 1000 Hz @ $0.019 \text{ g}^2/\text{Hz}$
	1000 - 2000 Hz @ -3 dB/oct
	2000 Hz @ $0.0085 \text{ g}^2/\text{Hz}$
Composite = $6.0 \text{ g}_{\text{rms}}$	Composite = $5.0 \text{ g}_{\text{rms}}$

5-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-1-AP Input to Components Mounted on the Ogive Aft Section
 (X_T 747 to X_T 537) and within $\pm 10^\circ$ of the GO_2 Press.
 Line/Cable Tray Installation. Weight of Component
 < 10 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 100 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 100 - 200 Hz @ +6 dB/oct
 200 - 1000 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.05 \text{ g}^2/\text{Hz}$

Composite = $16.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00010 \text{ g}^2/\text{Hz}$
 20 - 160 Hz @ +10 dB/oct
 160 - 1000 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.05 \text{ g}^2/\text{Hz}$

Composite = $12.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.12 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.030 \text{ g}^2/\text{Hz}$

Composite = $13.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0018 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +6 dB/oct
 100 - 550 Hz @ $0.046 \text{ g}^2/\text{Hz}$
 550 - 700 Hz @ +9 dB/oct
 700 - 1000 Hz @ $0.092 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.046 \text{ g}^2/\text{Hz}$

Composite = $11.1 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +3 dB/oct
 40 - 100 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 100 - 200 Hz @ +6 dB/oct
 200 - 1000 Hz @ $0.8 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.2 \text{ g}^2/\text{Hz}$

Composite = $33.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00042 \text{ g}^2/\text{Hz}$
 20 - 160 Hz @ +10 dB/oct
 160 - 1000 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.2 \text{ g}^2/\text{Hz}$

Composite = $25.0 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*

5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-1-BP Input to Components Mounted on the Ogive Aft Section
 (X_T 747 to X_T 537) and within $\pm 10^\circ$ of the GO_2 Press.
 Line/Cable Tray Installation. Weight of Component ≥ 10
 but < 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.018 \text{ g}^2/\text{Hz}$
 20 - 29 Hz @ +3 dB/oct
 29 - 100 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 100 - 200 Hz @ +6 dB/oct
 200 - 1000 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $12.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00010 \text{ g}^2/\text{Hz}$
 20 - 130 Hz @ +10 dB/oct
 130 - 1000 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $8.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.060 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.015 \text{ g}^2/\text{Hz}$

Composite = $9.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0018 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +6 dB/oct
 70 - 550 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 550 - 700 Hz @ +9 dB/oct
 700 - 1000 Hz @ $0.046 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.023 \text{ g}^2/\text{Hz}$

Composite = $7.9 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.07 \text{ g}^2/\text{Hz}$
 20 - 29 Hz @ +3 dB/oct
 29 - 100 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 100 - 200 Hz @ +6 dB/oct
 200 - 1000 Hz @ $0.4 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.1 \text{ g}^2/\text{Hz}$

Composite = $24.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00042 \text{ g}^2/\text{Hz}$
 20 - 130 Hz @ +10 dB/oct
 130 - 1000 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.1 \text{ g}^2/\text{Hz}$

Composite = $17.8 \text{ g}_{\text{rms}}$

5-1-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-1-CP Input to Components Mounted on the Ogive Aft Section
 (X_T 747 to X_T 537) and within $\pm 10^\circ$ of the GO_2 Press.
 Line/Cable Tray Installation. Weight of Component
 ≥ 30 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 100 Hz @ $0.013 \text{ g}^2/\text{Hz}$
 100 - 200 Hz @ +6 dB/oct
 200 - 1000 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$

Composite = $8.6 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00010 \text{ g}^2/\text{Hz}$
 20 - 105 Hz @ +10 dB/oct
 105 - 1000 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.013 \text{ g}^2/\text{Hz}$

Composite = $6.4 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Radial Axis

20 - 1000 Hz @ $0.030 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.0075 \text{ g}^2/\text{Hz}$

Composite = $6.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0018 \text{ g}^2/\text{Hz}$
 20 - 50 Hz @ +6 dB/oct
 50 - 550 Hz @ $0.011 \text{ g}^2/\text{Hz}$
 550 - 700 Hz @ +9 dB/oct
 700 - 1000 Hz @ $0.023 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.011 \text{ g}^2/\text{Hz}$

Composite = $5.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 - 100 Hz @ $0.05 \text{ g}^2/\text{Hz}$
 100 - 200 Hz @ +6 dB/oct
 200 - 1000 Hz @ $0.2 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.05 \text{ g}^2/\text{Hz}$

Composite = $17.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00042 \text{ g}^2/\text{Hz}$
 20 - 105 Hz @ +10 dB/oct
 105 - 1000 Hz @ $0.1 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.05 \text{ g}^2/\text{Hz}$

Composite = $12.7 \text{ g}_{\text{rms}}$

5-1-CP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria (2 shocks/axis)

See Table I

* Design Criteria Only

Subzone 5-2 ET Ogive, Forward Section (Stations X_t 537 to X_t 371).
(General Specifications)

Same as Subzone 5-2-A below.

Subzone 5-2-A Input to Components Mounted on the ET Ogive, Forward
Section (Stations X_t 537 to X_t 371) and not within $\pm 10^\circ$
of the GO_2 Pressure Line/Cable Tray Installation. Weight
of Component ≤ 7 lbs.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
80 Hz @ +6 dB/oct
80 - 150 Hz @ $0.10 \text{ g}^2/\text{Hz}$
150 - 300 Hz @ +6 dB/oct
300 - 500 Hz @ $0.40 \text{ g}^2/\text{Hz}$
500 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.10 \text{ g}^2/\text{Hz}$

Composite = $20.0 \text{ g}_{\text{rms}}$

Directions B and C

20 - 20 Hz @ $0.000075 \text{ g}^2/\text{Hz}$
100 Hz @ +9 dB/oct
100 - 500 Hz @ $0.010 \text{ g}^2/\text{Hz}$
500 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ $0.020 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.010 \text{ g}^2/\text{Hz}$

Composite = $5.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ $0.026 \text{ g}^2/\text{Hz}$
80 Hz @ +6 dB/oct
80 - 150 Hz @ $0.40 \text{ g}^2/\text{Hz}$
150 - 300 Hz @ +6 dB/oct
300 - 500 Hz @ $1.60 \text{ g}^2/\text{Hz}$
500 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.41 \text{ g}^2/\text{Hz}$

Composite = $40.1 \text{ g}_{\text{rms}}$

Directions B and C

20 - 20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
100 Hz @ +9 dB/oct
100 - 500 Hz @ $0.040 \text{ g}^2/\text{Hz}$
500 - 700 Hz @ +6 dB/oct
700 - 1000 Hz @ $0.080 \text{ g}^2/\text{Hz}$
1000 - 2000 Hz @ -3 dB/oct
2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $10.4 \text{ g}_{\text{rms}}$

5-2-A (Cont.)

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.0015 \text{ g}^2/\text{Hz}$
20 - 400 Hz @ +6 dB/oct
400 - 800 Hz @ $0.60 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.097 \text{ g}^2/\text{Hz}$

Composite = $24.7 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00032 \text{ g}^2/\text{Hz}$
20 - 600 Hz @ +4 dB/oct
600 - 2000 Hz @ $0.030 \text{ g}^2/\text{Hz}$

Composite = $7.1 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable.

Direction A - Perpendicular to Ogive

Direction B - Tangential to Ogive

Direction C - Tangential to Ogive, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-2-B Input to Components Mounted on the ET Ogive, Forward Section (Stations X_t 537 to X_t 371) and not within $\pm 10^\circ$ of the GO_2 Pressure Line/Cable Tray Installation. Weight of Component ≥ 7 but < 21 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 - 20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
 56 - 56 Hz @ +6 dB/oct
 56 - 150 Hz @ $0.050 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $0.20 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.050 \text{ g}^2/\text{Hz}$

Composite = $14.2 \text{ g}_{\text{rms}}$

Directions B and C

20 - 20 Hz @ $0.000075 \text{ g}^2/\text{Hz}$
 80 - 80 Hz @ +9 dB/oct
 80 - 500 Hz @ $0.0050 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.010 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.0050 \text{ g}^2/\text{Hz}$

Composite = $3.7 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 - 20 Hz @ $0.026 \text{ g}^2/\text{Hz}$
 56 - 56 Hz @ +6 dB/oct
 56 - 150 Hz @ $0.20 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $0.80 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.20 \text{ g}^2/\text{Hz}$

Composite = $28.4 \text{ g}_{\text{rms}}$

Directions B and C

20 - 20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
 80 - 80 Hz @ +9 dB/oct
 80 - 500 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.040 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $7.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 - 20 Hz @ $0.0015 \text{ g}^2/\text{Hz}$
 280 - 280 Hz @ +6 dB/oct
 280 - 800 Hz @ $0.30 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.048 \text{ g}^2/\text{Hz}$

Composite = $18.1 \text{ g}_{\text{rms}}$

Directions B and C

20 - 20 Hz @ $0.00016 \text{ g}^2/\text{Hz}$
 600 - 600 Hz @ +4 dB/oct
 600 - 2000 Hz @ $0.014 \text{ g}^2/\text{Hz}$

Composite = $5.0 \text{ g}_{\text{rms}}$

5-2-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Ogive

Direction B — Tangential to Ogive

Direction C — Tangential to Ogive, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-2-C Input to Components Mounted on the ET Ogive, Forward Section (Stations X_t 537 to X_t 371) and not within $\pm 10^\circ$ of the GO_2 Pressure Line/Cable Tray Installation. Weight of Component ≥ 21 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.0065 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +6 dB/oct
 40 - 150 Hz @ $0.025 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $0.10 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.025 \text{ g}^2/\text{Hz}$

Composite = $10.0 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.000075 \text{ g}^2/\text{Hz}$
 20 - 64 Hz @ +9 dB/oct
 64 - 500 Hz @ $0.0025 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.0050 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.0025 \text{ g}^2/\text{Hz}$

Composite = $2.6 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.026 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +6 dB/oct
 40 - 150 Hz @ $0.10 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $0.40 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.10 \text{ g}^2/\text{Hz}$

Composite = $20.1 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
 20 - 64 Hz @ +9 dB/oct
 64 - 500 Hz @ $0.010 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.010 \text{ g}^2/\text{Hz}$

Composite = $5.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.0015 \text{ g}^2/\text{Hz}$
 20 - 200 Hz @ +6 dB/oct
 200 - 800 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 800 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.024 \text{ g}^2/\text{Hz}$

Composite = $13.1 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00016 \text{ g}^2/\text{Hz}$
 20 - 600 Hz @ +4 dB/oct
 600 - 2000 Hz @ $0.014 \text{ g}^2/\text{Hz}$

Composite = $5.0 \text{ g}_{\text{rms}}$

5-2-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Ogive

Direction B — Tangential to Ogive

Direction C — Tangential to Ogive, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-2-AP Input to Components Mounted on the Ogive Forward Section (X_T 537 to X_T 371) and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component < 7 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.00013 \text{ g}^2/\text{Hz}$
 20 - 270 Hz @ +12 dB/oct
 270 - 900 Hz @ $3.5 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.73 \text{ g}^2/\text{Hz}$

Composite = $64.0 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.000088 \text{ g}^2/\text{Hz}$
 20 - 190 Hz @ +10 dB/oct
 190 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $15.2 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.026 \text{ g}^2/\text{Hz}$
 20 - 80 Hz @ +6 dB/oct
 80 - 150 Hz @ $0.40 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $1.60 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.41 \text{ g}^2/\text{Hz}$

Composite = $40.1 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +9 dB/oct
 100 - 500 Hz @ $0.040 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.080 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $10.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.0005 \text{ g}^2/\text{Hz}$
 20 - 270 Hz @ +12 dB/oct
 270 - 900 Hz @ $14.0 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $2.9 \text{ g}^2/\text{Hz}$

Composite = $128.0 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.00035 \text{ g}^2/\text{Hz}$
 20 - 190 Hz @ +10 dB/oct
 190 - 1000 Hz @ $0.6 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.3 \text{ g}^2/\text{Hz}$

Composite = $30.4 \text{ g}_{\text{rms}}$

5-2-AP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable.

Direction A -- Perpendicular to Ogive

Direction B -- Tangential to Ogive

Direction C -- Tangential to Ogive, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-2-BP Input to Components Mounted on the Ogive Forward Section (X_T 537 to X_T 371) and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 7 but < 21 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.00013 \text{ g}^2/\text{Hz}$
 20 - 230 Hz @ +12 dB/oct
 230 - 900 Hz @ $1.75 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.38 \text{ g}^2/\text{Hz}$

Composite = $45.7 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.000088 \text{ g}^2/\text{Hz}$
 20 - 155 Hz @ +10 dB/oct
 155 - 1000 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.038 \text{ g}^2/\text{Hz}$

Composite = $10.9 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.026 \text{ g}^2/\text{Hz}$
 20 - 56 Hz @ +6 dB/oct
 56 - 150 Hz @ $0.20 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $0.80 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.20 \text{ g}^2/\text{Hz}$

Composite = $28.4 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
 20 - 80 Hz @ +9 dB/oct
 80 - 500 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.040 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $7.4 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.0005 \text{ g}^2/\text{Hz}$
 20 - 230 Hz @ +12 dB/oct
 230 - 900 Hz @ $7.0 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $1.5 \text{ g}^2/\text{Hz}$

Composite = $91.3 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.00035 \text{ g}^2/\text{Hz}$
 20 - 155 Hz @ +10 dB/oct
 155 - 1000 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.15 \text{ g}^2/\text{Hz}$

Composite = $21.7 \text{ g}_{\text{rms}}$

5-2-BP (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Ogive

Direction B — Tangential to Ogive

Direction C — Tangential to Ogive, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-2-CP Input to Components Mounted on the Ogive Forward Section (X_T 537 to X_T 371) and within $\pm 10^\circ$ of the GO_2 Press. Line/Cable Tray Installation. Weight of Component ≥ 21 lb.

1. Acceptance Test Criteria (1 min/axis)

Direction A

20 Hz @ $0.00013 \text{ g}^2/\text{Hz}$
 20 - 190 Hz @ +7 dB/oct
 190 - 900 Hz @ $0.88 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.19 \text{ g}^2/\text{Hz}$

Composite = $34.5 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.000088 \text{ g}^2/\text{Hz}$
 20 - 125 Hz @ +10 dB/oct
 125 - 1000 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.019 \text{ g}^2/\text{Hz}$

Composite = $7.8 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.026 \text{ g}^2/\text{Hz}$
 20 - 40 Hz @ +6 dB/oct
 40 - 150 Hz @ $0.10 \text{ g}^2/\text{Hz}$
 150 - 300 Hz @ +6 dB/oct
 300 - 500 Hz @ $0.40 \text{ g}^2/\text{Hz}$
 500 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.10 \text{ g}^2/\text{Hz}$

Composite = $20.1 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00030 \text{ g}^2/\text{Hz}$
 20 - 64 Hz @ +9 dB/oct
 64 - 500 Hz @ $0.010 \text{ g}^2/\text{Hz}$
 500 - 700 Hz @ +6 dB/oct
 700 - 1000 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.010 \text{ g}^2/\text{Hz}$

Composite = $5.2 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Direction A

20 Hz @ $0.0005 \text{ g}^2/\text{Hz}$
 20 - 190 Hz @ +12 dB/oct
 190 - 900 Hz @ $3.5 \text{ g}^2/\text{Hz}$
 900 - 2000 Hz @ -6 dB/oct
 2000 Hz @ $0.75 \text{ g}^2/\text{Hz}$

Composite = $69.0 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.00035 \text{ g}^2/\text{Hz}$
 20 - 125 Hz @ +10 dB/oct
 125 - 1000 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 1000 - 2000 Hz @ -3 dB/oct
 2000 Hz @ $0.075 \text{ g}^2/\text{Hz}$

Composite = $15.5 \text{ g}_{\text{rms}}$

5-2-CP(Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*

6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Ogive

Direction B — Tangential to Ogive

Direction C — Tangential to Ogive, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-3 ET Nose Cap and Cover Plate (Stations X_t 371 to X_t 322).
(General Specifications)

Same as Subzone 5-3-1-A below.

Subzone 5-3-1 ET Nose Cap (Stations X_t 371 to X_t 322). (General
Specifications)

Same as Subzone 5-3-1-A below.

Subzone 5-3-1-A Input to Components Mounted on the ET Nose Cap
(Stations X_t 371 to X_t 322). Weight of Component < 7 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0024 \text{ g}^2/\text{Hz}$
20 - 900 Hz @ +6 dB/oct
900 - 2000 Hz @ $5.0 \text{ g}^2/\text{Hz}$

Composite = $83.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00024 \text{ g}^2/\text{Hz}$
20 - 140 Hz @ +10 dB/oct
140 - 240 Hz @ $0.15 \text{ g}^2/\text{Hz}$
240 - 900 Hz @ +3 dB/oct
900 - 2000 Hz @ $0.45 \text{ g}^2/\text{Hz}$

Composite = $26.5 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.0075 \text{ g}^2/\text{Hz}$
20 - 140 Hz @ +6 dB/oct
140 - 520 Hz @ $0.35 \text{ g}^2/\text{Hz}$
520 - 900 Hz @ +6 dB/oct
900 - 2000 Hz @ $1.00 \text{ g}^2/\text{Hz}$

Composite = $38.6 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.00033 \text{ g}^2/\text{Hz}$
20 - 100 Hz @ +9 dB/oct
100 - 500 Hz @ $0.040 \text{ g}^2/\text{Hz}$
500 - 800 Hz @ +6 dB/oct
800 - 2000 Hz @ $0.080 \text{ g}^2/\text{Hz}$

Composite = $11.5 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.0094 \text{ g}^2/\text{Hz}$
20 - 900 Hz @ +6 dB/oct
900 - 2000 Hz @ $20.0 \text{ g}^2/\text{Hz}$

Composite = $167.3 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00094 \text{ g}^2/\text{Hz}$
20 - 140 Hz @ +10 dB/oct
140 - 240 Hz @ $0.6 \text{ g}^2/\text{Hz}$
240 - 900 Hz @ +3 dB/oct
900 - 2000 Hz @ $1.8 \text{ g}^2/\text{Hz}$

Composite = $52.9 \text{ g}_{\text{rms}}$

5-3-1-A (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Nose Cap

Direction B — Tangential to Nose Cap

Direction C — Tangential to Nose Cap, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-3-1-B Input to Components Mounted on the ET Nose Cap
 (Stations X_t 371 to X_t 322). Weight of Component ≥ 7
 but < 20 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0024 \text{ g}^2/\text{Hz}$
 20 - 640 Hz @ +6 dB/oct
 640 - 2000 Hz @ $2.5 \text{ g}^2/\text{Hz}$

Composite = $62.7 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00024 \text{ g}^2/\text{Hz}$
 20 - 125 Hz @ +10 dB/oct
 125 - 240 Hz @ $0.075 \text{ g}^2/\text{Hz}$
 240 - 900 Hz @ +3 dB/oct
 900 - 2000 Hz @ $0.23 \text{ g}^2/\text{Hz}$

Composite = $18.7 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.0075 \text{ g}^2/\text{Hz}$
 20 - 100 Hz @ +6 dB/oct
 100 - 520 Hz @ $0.18 \text{ g}^2/\text{Hz}$
 520 - 900 Hz @ +6 dB/oct
 900 - 2000 Hz @ $0.50 \text{ g}^2/\text{Hz}$

Composite = $27.4 \text{ g}_{\text{rms}}$

Directions B and C

20 Hz @ $0.00033 \text{ g}^2/\text{Hz}$
 20 - 80 Hz @ +9 dB/oct
 80 - 500 Hz @ $0.020 \text{ g}^2/\text{Hz}$
 500 - 800 Hz @ +6 dB/oct
 800 - 2000 Hz @ $0.040 \text{ g}^2/\text{Hz}$

Composite = $8.0 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.0094 \text{ g}^2/\text{Hz}$
 20 - 640 Hz @ +6 dB/oct
 640 - 2000 Hz @ $10.0 \text{ g}^2/\text{Hz}$

Composite = $125.4 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00094 \text{ g}^2/\text{Hz}$
 20 - 125 Hz @ +10 dB/oct
 125 - 240 Hz @ $0.3 \text{ g}^2/\text{Hz}$
 240 - 900 Hz @ +3 dB/oct
 900 - 2000 Hz @ $0.9 \text{ g}^2/\text{Hz}$

Composite = $37.4 \text{ g}_{\text{rms}}$

5-3-1-B (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*

5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*

6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A — Perpendicular to Nose Cap

Direction B — Tangential to Nose Cap

Direction C — Tangential to Nose Cap, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-3-1-C Input to Components Mounted on the ET Nose Cap
 (Stations X_t 371 to X_t 322). Weight of Component
 ≥ 20 lb.

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 Hz @ $0.0024 \text{ g}^2/\text{Hz}$
 20 - 450 Hz @ +6 dB/oct
 450 - 2000 Hz @ $1.3 \text{ g}^2/\text{Hz}$

Composite = $46.1 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00024 \text{ g}^2/\text{Hz}$
 20 - 94 Hz @ +10 dB/oct
 94 - 240 Hz @ $0.038 \text{ g}^2/\text{Hz}$
 240 - 900 Hz @ +3 dB/oct
 900 - 2000 Hz @ $0.11 \text{ g}^2/\text{Hz}$

Composite = $13.3 \text{ g}_{\text{rms}}$

2. Lift-off Random Vibration Criteria (1 min/axis)

Direction A

20 Hz @ $0.0075 \text{ g}^2/\text{Hz}$
 20 - 70 Hz @ +6 dB/oct
 70 - 520 Hz @ $0.090 \text{ g}^2/\text{Hz}$
 520 - 900 Hz @ +6 dB/oct
 900 - 2000 Hz @ $0.25 \text{ g}^2/\text{Hz}$

Composite = $19.4 \text{ g}_{\text{rms}}$

Directions B & C

20 Hz @ $0.00033 \text{ g}^2/\text{Hz}$
 20 - 63 Hz @ +9 dB/oct
 63 - 500 Hz @ $0.010 \text{ g}^2/\text{Hz}$
 500 - 800 Hz @ +6 dB/oct
 800 - 2000 Hz @ $0.020 \text{ g}^2/\text{Hz}$

Composite = $5.7 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria (2 min/axis)

Radial Axis

20 Hz @ $0.0094 \text{ g}^2/\text{Hz}$
 20 - 450 Hz @ +6 dB/oct
 450 - 2000 Hz @ $5.0 \text{ g}^2/\text{Hz}$

Composite = $92.2 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.00094 \text{ g}^2/\text{Hz}$
 20 - 94 Hz @ +10 dB/oct
 94 - 240 Hz @ $0.15 \text{ g}^2/\text{Hz}$
 240 - 900 Hz @ +3 dB/oct
 900 - 2000 Hz @ $0.45 \text{ g}^2/\text{Hz}$

Composite = $26.5 \text{ g}_{\text{rms}}$

5-3-1-C (Cont.)

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 6 Hz @ 1.4 G's peak*
6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

Direction A -- Perpendicular to Nose Cap

Direction B -- Tangential to Nose Cap

Direction C -- Tangential to Nose Cap, Perpendicular to Direction B

* Design Criteria Only

Subzone 5-3-2 Input to Components Mounted on the ET LO₂ Ogive
 Coverplate or Coverplate Support Ring. (Station X_t
 371)

1. Acceptance Test Criteria (1 min/axis)

Longitudinal Axis

20 - 20 Hz @ 0.0035 g²/Hz
 42 Hz @ +6 dB/oct
 42 - 370 Hz @ 0.015 g²/Hz
 370 - 900 Hz @ +6 dB/oct
 900 - 2000 Hz @ 0.088 g²/Hz

Composite = 11.2 g_{rms}

Lateral Axes

20 - 20 Hz @ 0.00050 g²/Hz
 49 Hz @ +9 dB/oct
 49 - 2000 Hz @ 0.0075 g²/Hz

Composite = 3.8 g_{rms}

2 and 3. Flight Random Vibration Criteria, Lift-off and Boost
 (3 minutes/axis)

Longitudinal Axis

20 - 20 Hz @ 0.0067 g²/Hz
 70 Hz @ +12 dB/oct
 70 - 100 Hz @ 1.0 g²/Hz
 100 - 320 Hz @ -6 dB/oct
 320 - 500 Hz @ 0.1 g²/Hz
 500 - 1000 Hz @ +6 dB/oct
 1000 - 1400 Hz @ 0.4 g²/Hz
 1400 - 2000 Hz @ -12 dB/oct
 2000 Hz @ 0.096 g²/Hz

Composite 23.0 g_{rms}

Radial & Tangential Axes

20 - 20 Hz @ 0.0024 g²/Hz
 60 Hz @ +12 dB/oct
 60 - 200 Hz @ 0.2 g²/Hz
 200 - 430 Hz @ -12 dB/oct
 430 - 1300 Hz @ 0.01 g²/Hz
 1300 - 2000 Hz @ -12 dB/oct
 2000 Hz @ 0.0018 g²/Hz

Composite = 7.4 g_{rms}

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
 5 - 40 Hz @ 0.6 G's peak

Lateral Axes

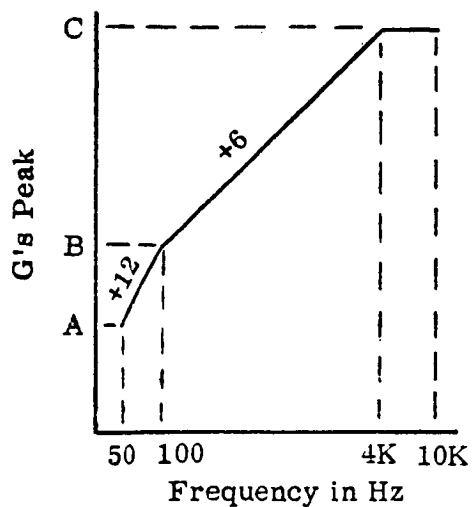
2 - 6 Hz @ 1.4 G's peak*
 6 - 40 Hz @ 1.4 G's peak

5. Shock Test Criteria (2 shocks/axis)

Not Applicable

* Design Criteria Only

**PYROTECHNIC SHOCK SPECTRUM CRITERIA
FOR COMPONENTS MOUNTED TO SPACE SHUTTLE STRUCTURE**



SHOCK SPECTRUM

50 Hz @ A G's peak
50 - 100 Hz @ +12 dB/oct
100 Hz @ B G's peak
100 - 4000 Hz @ +6 dB/oct
4000 - 10000 Hz @ C G's peak

Note: For proper spectrum, use most severe of applicable levels from tables below.

TABLE I. LIGHTWEIGHT TANK

Shock Source	D = Distance from component to ET/SRB Fwd Attach Point (in.)	Spectrum Amplitudes		
		A	B	C
Fwd Attach Bolts	$0 < D < 12$	94	375	15,000
	$12 < D < 24$	47	188	7,500
	$24 < D < 48$	24	94	3,750
	$48 < D < 96$	12	47	1,875
	$96 < D$	N/A	N/A	N/A
	d = Distance from component to ET/SRB Aft Attach Point (in.)			
Aft Attach Bolts	$0 < d < 12$	24	94	3,750
	$12 < d < 24$	12	47	1,875
	$24 < d$	N/A	N/A	N/A

SECTION VIII. ACOUSTIC TEST SPECIFICATIONS

Zone 1-1. ET Aft LH₂ Bulkhead Gores (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 μ N/m²)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	127.0	143.5	159.0
6.3	129.5	144.5	158.0
8.0	131.5	145.5	157.0
10.0	134.0	146.5	156.0
12.5	136.0	147.5	155.0
16.0	138.0	148.5	154.0
20.0	140.0	149.5	153.0
25.0	142.0	150.5	152.0
31.5	144.0	151.0	151.0
40.0	145.5	152.0	150.0
50.0	147.5	152.5	148.0
63.0	149.0	153.0	146.0
80.0	150.0	153.0	144.0
100.0	151.0	153.0	142.0
125.0	152.0	153.0	140.0
160.0	153.0	153.0	138.0
200.0	153.5	153.0	136.0
250.0	154.0	153.0	134.0
315.0	154.5	152.5	132.0
400.0	154.5	152.0	130.0
500.0	154.0	151.5	128.0
630.0	153.5	151.0	126.0
800.0	153.5	150.0	124.0
1000.0	153.0	149.5	122.0
1250.0	152.5	148.5	120.0
1600.0	151.5	148.0	118.0
2000.0	151.0	147.0	116.0
2500.0	150.0	146.0	114.0
3150.0	149.0	145.0	112.0
4000.0	147.5	144.0	110.0
5000.0	146.5	143.0	108.0
6300.0	145.0	142.0	106.0
8000.0	144.0	141.0	104.0
10000.0	143.0	140.0	102.0
Overall SPL	165.5	165.5	165.5
Duration	1 min	2 min	N/A

SECTION VIII. ACOUSTIC TEST SPECIFICATIONS

Zone 1-2-ET Aft LH₂ Bulkhead (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	127.0	138.0	159.0
6.3	129.5	139.0	158.0
8.0	131.5	140.0	157.0
10.0	134.0	141.0	156.0
12.5	136.0	142.0	155.0
16.0	138.0	142.5	154.0
20.0	140.0	143.0	153.0
25.0	142.0	144.0	152.0
31.5	144.0	144.5	151.0
40.0	145.5	145.0	150.0
50.0	147.5	145.5	148.0
63.0	149.0	146.0	146.0
80.0	150.0	146.5	144.0
100.0	151.0	147.0	142.0
125.0	152.0	147.0	140.0
160.0	153.0	147.0	138.0
200.0	153.5	147.0	136.0
250.0	154.0	147.0	134.0
315.0	154.5	146.5	132.0
400.0	154.5	146.0	130.0
500.0	154.0	146.0	128.0
630.0	153.5	145.5	126.0
800.0	153.5	145.0	124.0
1000.0	153.0	144.0	122.0
1250.0	152.5	143.0	120.0
1600.0	151.5	142.5	118.0
2000.0	151.0	142.0	116.0
2500.0	150.0	141.5	114.0
3150.0	149.0	140.5	112.0
4000.0	147.5	139.5	110.0
5000.0	146.5	138.5	108.0
6300.0	145.0	137.5	106.0
8000.0	144.0	137.0	104.0
10000.0	143.0	136.0	102.0
Overall SPL	165.5	159.5	165.5
Duration.	1 min	2 min	N/A

Subzone 2-1 - ET LH₂ Tank Cylinder, Inboard (Orbiter) Side, Aft
Section (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 μ N/m²)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	131.0	139.0	159.0
6.3	132.5	140.0	158.0
8.0	134.0	141.0	157.0
10.0	135.5	141.5	156.0
12.5	136.5	142.0	155.0
16.0	138.0	142.5	154.0
20.0	139.0	142.5	153.0
25.0	140.0	143.0	152.0
31.5	141.5	144.0	151.0
40.0	142.0	145.0	150.0
50.0	143.0	146.0	148.0
63.0	144.0	146.5	146.0
80.0	144.5	147.0	144.0
100.0	145.0	147.5	142.0
125.0	145.5	148.0	140.0
160.0	145.5	148.5	138.0
200.0	146.0	148.5	136.0
250.0	146.0	148.0	134.0
315.0	146.0	148.0	132.0
400.0	145.5	147.5	130.0
500.0	145.5	146.5	128.0
630.0	145.0	146.0	126.0
800.0	144.5	145.5	124.0
1000.0	143.5	144.5	122.0
1250.0	143.0	144.0	120.0
1600.0	142.0	143.5	118.0
2000.0	141.0	143.0	116.0
2500.0	140.0	142.5	114.0
3150.0	139.5	141.5	112.0
4000.0	138.5	141.0	110.0
5000.0	137.5	140.0	108.0
6300.0	137.0	139.0	106.0
8000.0	136.0	138.5	104.0
10000.0	135.0	138.0	102.0
Overall SPL	158.0	160.0	165.5
Duration	1 min	2 min	N/A

Subzone 2-2 - ET LH₂ Tank Cylinder, Outboard Side, Aft Section
(General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	131.0	114.5	159.0
6.3	132.5	116.0	158.0
8.0	134.0	118.0	157.0
10.0	135.5	120.0	156.0
12.5	136.5	121.5	155.0
16.0	138.0	123.0	154.0
20.0	139.0	124.5	153.0
25.0	140.0	126.0	152.0
31.5	141.5	127.5	151.0
40.0	142.0	129.0	150.0
50.0	143.0	130.5	148.0
63.0	144.0	131.0	146.0
80.0	144.5	132.0	144.0
100.0	145.0	133.0	142.0
125.0	145.5	134.0	140.0
160.0	145.5	134.0	138.0
200.0	146.0	134.5	136.0
250.0	146.0	134.5	134.0
315.0	146.0	134.5	132.0
400.0	145.5	134.5	130.0
500.0	145.5	134.5	128.0
630.0	145.0	134.0	126.0
800.0	144.5	134.0	124.0
1000.0	143.5	133.5	122.0
1250.0	143.0	133.5	120.0
1600.0	142.0	133.0	118.0
2000.0	141.0	132.5	116.0
2500.0	140.0	132.0	114.0
3150.0	139.5	131.5	112.0
4000.0	138.5	130.5	110.0
5000.0	137.5	130.0	108.0
6300.0	137.0	129.0	106.0
8000.0	136.0	128.5	104.0
10000.0	135.0	128.0	102.0
Overall SPL	158.0	147.0	165.5
Duration	1 min	2 min	N/A

Subzone 2-3 - ET LH₂ Tank Cylinder, Inboard (Orbiter) Side, Forward
Section (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	139.0	159.0
6.3	131.5	140.0	158.0
8.0	133.0	141.0	157.0
10.0	134.5	142.5	156.0
12.5	135.5	143.5	155.0
16.0	137.0	144.5	154.0
20.0	138.0	145.0	153.0
25.0	139.0	146.0	152.0
31.5	140.0	146.0	151.0
40.0	141.0	146.0	150.0
50.0	142.0	147.0	148.0
63.0	142.5	147.0	146.0
80.0	142.5	147.0	144.0
100.0	143.0	147.0	142.0
125.0	143.5	147.0	140.0
160.0	143.5	147.0	138.0
200.0	143.5	147.0	136.0
250.0	143.5	147.0	134.0
315.0	143.0	146.0	132.0
400.0	143.0	145.0	130.0
500.0	142.5	144.0	128.0
630.0	142.0	144.0	126.0
800.0	141.5	144.0	124.0
1000.0	141.0	144.0	122.0
1250.0	140.0	144.0	120.0
1600.0	139.5	143.0	118.0
2000.0	138.5	142.0	116.0
2500.0	137.5	141.0	114.0
3150.0	137.0	140.0	112.0
4000.0	136.0	139.5	110.0
5000.0	135.0	138.5	108.0
6300.0	134.0	137.5	106.0
8000.0	133.0	136.5	104.0
10000.0	132.0	135.5	102.0
Overall SPL	155.5	159.5	165.5
Duration	1 min	2 min	N/A

Subzone 2-4 - ET LH₂ Tank Cylinder, Outboard Side, Forward Section
(General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	114.5	159.0
6.3	131.5	116.0	158.0
8.0	133.0	118.0	157.0
10.0	134.5	120.0	156.0
12.5	135.5	121.5	155.0
16.0	137.0	123.0	154.0
20.0	138.0	124.5	153.0
25.0	139.0	126.0	152.0
31.5	140.0	127.5	151.0
40.0	141.0	129.0	150.0
50.0	142.0	130.5	148.0
63.0	142.5	131.0	146.0
80.0	142.5	132.0	144.0
100.0	143.0	133.0	142.0
125.0	143.5	134.0	140.0
160.0	143.5	134.0	138.0
200.0	143.5	134.5	136.0
250.0	143.5	134.5	134.0
315.0	143.0	134.5	132.0
400.0	143.0	134.5	130.0
500.0	142.5	134.5	128.0
630.0	142.0	134.0	126.0
800.0	141.5	134.0	124.0
1000.0	141.0	133.5	122.0
1250.0	140.0	133.5	120.0
1600.0	139.5	133.0	118.0
2000.0	138.5	132.5	116.0
2500.0	137.5	132.0	114.0
3150.0	137.0	131.5	112.0
4000.0	136.0	130.5	110.0
5000.0	135.0	130.0	108.0
6300.0	134.0	129.0	106.0
8000.0	133.0	128.5	104.0
10000.0	132.0	128.0	102.0
Overall SPL	155.5	147.0	165.5
Duration	1 min	2 min	N/A

Zone 3 - ET Intertank Section (General Specifications)

INTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	115.0	118.0	
6.3	116.5	119.0	
8.0	117.5	119.5	
10.0	119.0	120.5	N
12.5	120.0	121.0	
16.0	121.0	122.0	O
20.0	122.5	123.0	
25.0	123.5	123.5	T
31.5	129.0	129.0	
40.0	134.0	133.5	
50.0	134.5	134.0	
63.0	135.0	134.5	
80.0	135.5	134.5	A
100.0	135.5	135.0	
125.0	136.0	135.0	P
160.0	135.5	135.0	
200.0	135.5	134.5	P
250.0	135.5	134.5	
315.0	135.0	134.0	L
400.0	134.5	133.5	
500.0	132.5	131.5	I
630.0	130.5	129.5	
800.0	128.5	127.5	C
1000.0	127.0	125.0	
1250.0	124.0	122.5	A
1600.0	121.5	122.5	
2000.0	118.5	118.0	B
2500.0	115.5	115.0	
3150.0	112.5	112.0	L
4000.0	109.5	109.5	
5000.0	107.0	107.0	E
6300.0	104.0	104.5	
8000.0	101.0	101.5	
10000.0	98.0	98.5	
Overall SPL	146.5	145.5	
Duration	1 min	2 min	

Subzone 3-1 - ET Intertank Section, Panels 1, 2, and 3, Fwd of $X_t = 985$,
(General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re $20 \mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	133.0	159.0
6.3	131.5	134.5	158.0
8.0	132.5	136.0	157.0
10.0	134.0	137.5	156.0
12.5	135.0	139.0	155.0
16.0	136.0	140.0	154.0
20.0	137.5	141.0	153.0
25.0	138.5	142.0	152.0
31.5	139.0	143.0	151.0
40.0	140.0	144.0	150.0
50.0	140.5	145.0	148.0
63.0	141.0	145.5	146.0
80.0	141.5	145.5	144.0
100.0	141.5	146.0	142.0
125.0	142.0	146.0	140.0
160.0	141.5	145.5	138.0
200.0	141.5	145.0	136.0
250.0	141.5	144.5	134.0
315.0	141.0	144.0	132.0
400.0	140.5	143.0	130.0
500.0	140.0	142.5	128.0
630.0	139.5	141.5	126.0
800.0	139.0	140.5	124.0
1000.0	138.0	139.5	122.0
1250.0	137.5	138.0	120.0
1600.0	136.5	137.0	118.0
2000.0	135.5	136.0	116.0
2500.0	134.5	135.0	114.0
3150.0	133.5	133.5	112.0
4000.0	132.5	132.0	110.0
5000.0	132.0	130.5	108.0
6300.0	131.0	129.0	106.0
8000.0	130.0	128.0	104.0
10000.0	129.0	126.5	102.0
Overall SPL	153.5	157.0	165.5
Duration	1 min	2 min	N/A

Subzone 3-1 - ET Intertank Section, Panels 1, 2, and 3, Aft of $X_T = 985$
(General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re $20 \mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	139.0	159.0
6.3	131.5	139.5	158.0
8.0	132.5	140.5	157.0
10.0	134.0	141.5	156.0
12.5	135.0	142.0	155.0
16.0	136.0	142.5	154.0
20.0	137.5	143.0	153.0
25.0	138.5	144.0	152.0
31.5	139.0	145.0	151.0
40.0	140.0	145.5	150.0
50.0	140.5	146.0	148.0
63.0	141.0	147.0	146.0
80.0	141.5	148.0	144.0
100.0	141.5	149.0	142.0
125.0	142.0	147.0	140.0
160.0	141.5	147.0	138.0
200.0	141.5	146.0	136.0
250.0	141.5	146.0	134.0
315.0	141.0	145.0	132.0
400.0	140.5	144.0	130.0
500.0	140.0	143.0	128.0
630.0	139.5	143.0	126.0
800.0	139.0	142.0	124.0
1000.0	138.0	141.0	122.0
1250.0	137.5	141.0	120.0
1600.0	136.5	140.0	118.0
2000.0	135.5	139.0	116.0
2500.0	134.5	138.0	114.0
3150.0	133.5	137.0	112.0
4000.0	132.5	136.0	110.0
5000.0	132.0	135.0	108.0
6300.0	131.0	134.0	106.0
8000.0	130.0	133.0	104.0
10000.0	129.0	132.0	102.0
Overall SPL	153.5	159.0	165.5
Duration	1 min	2 min	N/A

Subzone 3-2 - ET Intertank Section, Panels 4 and 5 (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re $20 \mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	144.0	159.0
6.3	131.5	145.0	158.0
8.0	132.5	147.0	157.0
10.0	134.0	148.5	156.0
12.5	135.0	149.0	155.0
16.0	136.0	150.5	154.0
20.0	137.5	150.0	153.0
25.0	138.5	153.0	152.0
31.5	139.0	154.0	151.0
40.0	140.0	154.5	150.0
50.0	140.5	155.0	148.0
63.0	141.0	155.5	146.0
80.0	141.5	156.0	144.0
100.0	141.5	156.5	142.0
125.0	142.0	156.5	140.0
160.0	141.5	156.0	138.0
200.0	141.5	156.0	136.0
250.0	141.5	156.0	134.0
315.0	141.0	155.5	132.0
400.0	140.5	155.0	130.0
500.0	140.0	154.5	128.0
630.0	139.5	154.0	126.0
800.0	139.0	153.0	124.0
1000.0	138.0	152.0	122.0
1250.0	137.5	151.5	120.0
1600.0	136.5	150.5	118.0
2000.0	135.5	149.5	116.0
2500.0	134.5	148.5	114.0
3150.0	133.5	147.0	112.0
4000.0	132.5	146.5	110.0
5000.0	132.0	145.0	108.0
6300.0	131.0	144.0	106.0
8000.0	130.0	143.0	104.0
10000.0	129.0	141.5	102.0
Overall SPL	153.5	168.5	165.5
Duration	1 min	2 min	N/A

Subzone 3-3 - ET Intertank Section, Panels 6, 7, and 8 (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	130.5	159.0
6.3	131.5	132.0	158.0
8.0	132.5	133.0	157.0
10.0	134.0	134.0	156.0
12.5	135.0	135.0	155.0
16.0	136.0	136.5	154.0
20.0	137.5	137.0	153.0
25.0	138.5	138.5	152.0
31.5	139.0	138.5	151.0
40.0	140.0	139.0	150.0
50.0	140.5	139.5	148.0
63.0	141.0	140.0	146.0
80.0	141.5	140.5	144.0
100.0	141.5	141.0	142.0
125.0	142.0	141.0	140.0
160.0	141.5	141.0	138.0
200.0	141.5	140.5	136.0
250.0	141.5	140.5	134.0
315.0	141.0	139.5	132.0
400.0	140.5	139.0	130.0
500.0	140.0	139.0	128.0
630.0	139.5	138.5	126.0
800.0	139.0	138.0	124.0
1000.0	138.0	137.5	122.0
1250.0	137.5	137.0	120.0
1600.0	136.5	136.0	118.0
2000.0	135.5	135.5	116.0
2500.0	134.5	135.0	114.0
3150.0	133.5	134.0	112.0
4000.0	132.5	133.0	110.0
5000.0	132.0	132.5	108.0
6300.0	131.0	131.5	106.0
8000.0	130.0	131.0	104.0
10000.0	129.0	130.0	102.0
Overall SPL	153.5	153.0	165.5
Duration	1 min	2 min	N/A

Zone 4 - ET LOX Tank Cylindrical Section (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	138.0	159.0
6.3	131.5	139.0	158.0
8.0	132.5	139.5	157.0
10.0	134.0	140.5	156.0
12.5	135.0	141.0	155.0
16.0	136.0	142.0	154.0
20.0	137.5	143.0	153.0
25.0	138.5	144.0	152.0
31.5	139.0	144.5	151.0
40.0	140.0	145.0	150.0
50.0	140.5	145.5	148.0
63.0	141.0	146.0	146.0
80.0	141.5	146.5	144.0
100.0	141.5	147.0	142.0
125.0	142.0	147.0	140.0
160.0	141.5	147.5	138.0
200.0	141.5	147.5	136.0
250.0	141.5	147.5	134.0
315.0	141.0	147.5	132.0
400.0	140.5	147.5	130.0
500.0	140.0	147.5	128.0
630.0	139.5	147.5	126.0
800.0	139.0	147.0	124.0
1000.0	138.0	147.0	122.0
1250.0	137.5	146.0	120.0
1600.0	136.5	145.5	118.0
2000.0	135.5	145.0	116.0
2500.0	134.5	144.0	114.0
3150.0	133.5	143.0	112.0
4000.0	132.5	141.5	110.0
5000.0	132.0	140.5	108.0
6300.0	131.0	139.0	106.0
8000.0	130.0	138.0	104.0
10000.0	129.0	137.0	102.0
Overall SPL	153.5	160.5	165.5
Duration	1 min	2 min	N/A

Zone 5-1 - ET Ogive and Nose Cap (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	120.0	159.0
6.3	131.5	121.0	158.0
8.0	132.5	122.0	157.0
10.0	134.0	123.5	156.0
12.5	135.0	125.0	155.0
16.0	136.0	126.0	154.0
20.0	137.5	127.0	153.0
25.0	138.5	128.0	152.0
31.5	139.0	129.0	151.0
40.0	140.0	130.0	150.0
50.0	140.5	131.0	148.0
63.0	141.0	132.0	146.0
80.0	141.5	133.0	144.0
100.0	141.5	134.0	142.0
125.0	142.0	135.0	140.0
160.0	141.5	136.0	138.0
200.0	141.5	136.5	136.0
250.0	141.5	137.0	134.0
315.0	141.0	137.5	132.0
400.0	140.5	138.0	130.0
500.0	140.0	138.0	128.0
630.0	139.5	138.0	126.0
800.0	139.0	138.0	124.0
1000.0	138.0	137.5	122.0
1250.0	137.5	137.0	120.0
1600.0	136.5	136.5	118.0
2000.0	135.5	136.0	116.0
2500.0	134.5	135.5	114.0
3150.0	133.5	135.0	112.0
4000.0	132.5	134.0	110.0
5000.0	132.0	133.0	108.0
6300.0	131.0	132.0	106.0
8000.0	130.0	131.0	104.0
10000.0	129.0	130.0	102.0
Overall SPL	153.5	149.5	165.5
Duration	1 min	2 min	N/A

Zone 5-2 - ET Ogive and Nose Cap (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	115.0	159.0
6.3	131.5	117.0	158.0
8.0	132.5	118.0	157.0
10.0	134.0	119.5	156.0
12.5	135.0	121.0	155.0
16.0	136.0	122.0	154.0
20.0	137.5	123.5	153.0
25.0	138.5	124.5	152.0
31.5	139.0	125.5	151.0
40.0	140.0	126.5	150.0
50.0	140.5	127.5	148.0
63.0	141.0	128.5	146.0
80.0	141.5	129.5	144.0
100.0	141.5	130.0	142.0
125.0	142.0	130.5	140.0
160.0	141.5	131.0	138.0
200.0	141.5	131.5	136.0
250.0	141.5	132.0	134.0
315.0	141.0	132.0	132.0
400.0	140.5	132.5	130.0
500.0	140.0	132.5	128.0
630.0	139.5	132.5	126.0
800.0	139.0	132.0	124.0
1000.0	138.0	132.0	122.0
1250.0	137.5	132.0	120.0
1600.0	136.5	131.5	118.0
2000.0	135.5	131.5	116.0
2500.0	134.5	131.5	114.0
3150.0	133.5	131.0	112.0
4000.0	132.5	131.0	110.0
5000.0	132.0	131.0	108.0
6300.0	131.0	130.5	106.0
8000.0	130.0	130.0	104.0
10000.0	129.0	130.0	102.0
Overall SPL	153.5	145.0	165.5
Duration	1 min	2 min	N/A

Zone 5-3-1 ET Ogive and Nose Cap (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re $20 \mu\text{N/m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	127.0	159.0
6.3	131.5	129.0	158.0
8.0	132.5	131.0	157.0
10.0	134.0	133.0	156.0
12.5	135.0	135.0	155.0
16.0	136.0	137.0	154.0
20.0	137.5	139.0	153.0
25.0	138.5	141.0	152.0
31.5	139.0	142.5	151.0
40.0	140.0	144.0	150.0
50.0	140.5	145.5	148.0
63.0	141.0	147.0	146.0
80.0	141.5	148.0	144.0
100.0	141.5	149.0	142.0
125.0	142.0	150.0	140.0
160.0	141.5	150.5	138.0
200.0	141.5	151.0	136.0
250.0	141.5	151.5	134.0
315.0	141.0	152.0	132.0
400.0	140.5	152.0	130.0
500.0	140.0	151.5	128.0
630.0	139.5	151.0	126.0
800.0	139.0	150.5	124.0
1000.0	138.0	150.0	122.0
1250.0	137.5	149.5	120.0
1600.0	136.5	149.0	118.0
2000.0	135.5	148.5	116.0
2500.0	134.5	147.5	114.0
3150.0	133.5	146.5	112.0
4000.0	132.5	145.5	110.0
5000.0	132.0	144.5	108.0
6300.0	131.0	143.5	106.0
8000.0	130.0	142.5	104.0
10000.0	129.0	141.5	102.0
Overall SPL	153.5	163.0	165.5
Duration	1 min	2 min	N/A

Zone 5-3-2 ET Ogive and Nose Cap (General Specifications)

EXTERNAL

(One-third Octave Band Acoustic Specification in dB re $20 \mu\text{N}/\text{m}^2$)

<u>Geometric Mean Frequency (Hz)</u>	<u>Lift-off</u>	<u>In-flight Fluctuating Pressure</u>	<u>Oscillating Shock</u>
5.0	130.0	127.5	159.0
6.3	131.5	129.0	158.0
8.0	132.5	131.0	157.0
10.0	134.0	132.5	156.0
12.5	135.0	134.0	155.0
16.0	136.0	135.0	154.0
20.0	137.5	137.0	153.0
25.0	138.5	138.0	152.0
31.5	139.0	139.5	151.0
40.0	140.0	140.5	150.0
50.0	140.5	142.0	148.0
63.0	141.0	143.0	146.0
80.0	141.5	144.0	144.0
100.0	141.5	145.0	142.0
125.0	142.0	146.0	140.0
160.0	141.5	146.5	138.0
200.0	141.5	147.0	136.0
250.0	141.5	147.0	134.0
315.0	141.0	148.0	132.0
400.0	140.5	148.0	130.0
500.0	140.0	148.0	128.0
630.0	139.5	148.0	126.0
800.0	139.0	147.5	124.0
1000.0	138.0	147.0	122.0
1250.0	137.5	146.5	120.0
1600.0	136.5	146.0	118.0
2000.0	135.5	145.5	116.0
2500.0	134.5	145.0	114.0
3150.0	133.5	144.0	112.0
4000.0	132.5	143.0	110.0
5000.0	132.0	142.5	108.0
6300.0	131.0	141.0	106.0
8000.0	130.0	140.0	104.0
10000.0	129.0	139.0	102.0
Overall SPL	153.5	159.5	165.5
Duration	1 min	2 min	N/A

PROTUBERANCE

IN-FLIGHT FLUCTUATING PRESSURE

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N/m}^2$)

Geometric Mean Frequency (Hz)	Protuberance ZONE A	Protuberance ZONE B	Protuberance ZONE C	Protuberance ZONE D
5.0	139.0	139.0	133.0	139.0
6.3	140.0	140.0	134.5	139.5
8.0	140.5	141.0	136.0	140.5
10.0	141.5	142.5	137.5	141.5
12.5	142.0	143.5	139.0	142.0
16.0	142.5	144.5	140.5	142.5
20.0	142.5	145.0	141.0	143.0
25.0	143.0	146.0	142.0	144.0
31.5	144.0	146.0	143.0	145.0
40.0	145.0	146.0	144.0	145.5
50.0	146.0	147.0	145.0	146.0
63.0	146.5	147.0	145.5	147.0
80.0	147.0	147.0	145.5	148.0
100.0	147.5	147.0	146.0	148.0
125.0	148.5	148.5	147.0	149.0
160.0	151.0	151.0	152.0	151.0
200.0	152.0	152.0	151.0	152.0
250.0	152.0	152.0	150.0	152.0
315.0	150.0	150.0	146.0	150.0
400.0	148.0	149.0	146.0	149.0
500.0	148.0	148.0	145.0	148.0
630.0	148.0	148.0	145.0	148.0
800.0	147.5	147.5	146.0	147.0
1000.0	146.5	146.5	146.0	146.0
1250.0	145.5	145.5	144.0	145.0
1600.0	145.0	145.0	143.0	145.0
2000.0	144.5	144.5	142.0	144.0
2500.0	143.5	143.5	140.5	143.0
3150.0	142.5	142.5	139.0	142.0
4000.0	142.0	141.5	137.0	140.5
5000.0	141.0	140.5	135.0	139.5
6300.0	140.0	139.5	133.0	138.5
8000.0	139.0	138.5	131.0	137.5
10000.0	138.5	137.5	129.0	136.0
Overall SPL	161.5	162.0	160.0	161.5

Protuberance Zone A: Criteria are applicable to GO₂ pressure line/cable tray installation $\pm 10^\circ$ in zone 2-1.

Protuberance Zone B: Criteria are applicable to GO₂ pressure line/cable tray installation $\pm 10^\circ$ in zone 2-3.

Protuberance Zone C: Criteria are applicable to GO₂ pressure line/cable tray installation $\pm 10^\circ$ in zone 3-1, Fwd of X_T = 985.

Protuberance Zone D: Criteria are applicable to GO₂ pressure line/cable tray installation $\pm 10^\circ$ in zone 3-1, Aft of X_T = 985.

PROTUBERANCE

IN-FLIGHT FLUCTUATING PRESSURE

(One-third Octave Band Acoustic Specification in dB re 20 $\mu\text{N}/\text{m}^2$)

Geometric Mean Frequency (Hz)	Protuberance ZONE E	Protuberance ZONE F	Protuberance ZONE G	Protuberance ZONE H
5.0	132.5	140.0	142.5	137.0
6.3	133.0	143.0	144.0	139.0
8.0	133.5	146.0	146.5	141.0
10.0	134.0	149.0	148.0	143.5
12.5	134.5	151.5	149.0	145.0
16.0	135.5	153.5	150.0	147.5
20.0	136.0	167.0	151.5	149.0
25.0	137.0	168.0	153.0	150.0
31.0	137.0	168.0	154.0	151.0
40.0	138.0	170.0	155.0	152.0
50.0	138.0	160.0	156.0	153.0
63.0	140.0	154.0	156.5	153.5
80.0	141.5	154.0	157.0	154.0
100.0	144.0	153.5	157.5	154.0
125.0	147.0	153.0	158.0	154.0
160.0	152.0	152.5	158.5	154.0
200.0	151.0	152.0	159.0	153.5
250.0	150.0	151.5	159.0	153.0
315.0	146.0	151.0	159.0	152.5
400.0	146.0	150.0	158.5	152.0
500.0	145.0	149.0	158.0	151.5
630.0	145.0	148.0	157.5	151.0
800.0	146.0	147.0	157.0	150.0
1000.0	146.0	146.0	156.5	149.0
1250.0	144.0	145.0	156.0	148.0
1600.0	143.0	144.0	155.0	147.0
2000.0	142.0	143.0	154.0	146.0
2500.0	141.0	142.0	153.0	145.0
3150.0	140.0	141.0	152.0	144.0
4000.0	138.5	140.0	151.0	143.0
5000.0	137.0	139.0	150.0	142.0
6300.0	136.0	138.0	149.0	141.0
8000.0	134.5	137.0	148.0	140.0
10000.0	133.0	136.0	147.0	139.0
Overall SPL	159.5	175.0	170.5	165.5

Protuberance Zone E: Criteria are applicable to GO_2 pressure line/cable tray $\pm 10^\circ$ in zones 4, 5-1, and 5-2.

Protuberance Zone F: Criteria are applicable to forward SRB attach $\pm 10^\circ$ between $X_T = 985$ and $X_T = 1300$.

Protuberance Zone G: Criteria are applicable to forward orbiter attach $\pm 5^\circ$ between $X_T = 1100$ and $X_T = 1200$.

Protuberance Zone H: Criteria are applicable to aft attach cross beam.

SECTION IX. TRANSPORTATION SPECIFICATIONS

A. Vibration

Vibration test frequencies should be swept logarithmically from 5 Hz to the maximum frequency and back to 5 Hz at 1 oct/min in each of three mutually perpendicular axes. Criteria below 5 Hz are for design consideration only, and no test is required. A 15 minute dwell is required at each major component resonance at the amplitude specified for the sweep test.

1. Aircraft

o Jet (5-200-5 Hz @ 1 oct/min)

- 5 - 10 Hz @ 0.022 in. D. A. Disp.
- 10 - 35 Hz @ 0.11 G's peak
- 35 - 200 Hz @ 0.0017 in. D. A. Disp.
- 200 - 2000 Hz @ 3.5 G's peak

o Propeller (5-700-5 Hz @ 1 oct/min)

- 2 - 4 Hz @ 0.42 in. D. A. Disp.*
- 4 - 5 Hz @ 0.35 G's peak*
- 5 - 12 Hz @ 0.35 G's peak
- 12 - 55 Hz @ 0.046 in. D. A. Disp.
- 55 - 300 Hz @ 7.0 G's peak
- 300 - 700 Hz @ 3.5 G's peak

o Helicopter (5-600-5 Hz @ 1 oct/min)

- 5 - 12 Hz @ 0.22 in. D. A. Disp.
- 12 - 40 Hz @ 1.6 G's peak
- 40 - 55 Hz @ 0.019 in. D. A. Disp.
- 55 - 120 Hz @ 3.0 G's peak
- 120 - 170 Hz @ 0.0040 in. D. A. Disp.
- 170 - 220 Hz @ 6.0 G's peak
- 220 - 260 Hz @ 0.0024 in. D. A. Disp.
- 260 - 600 Hz @ 8.0 G's peak

* Design Criteria Only — no test required.

2. Trucks

o Smooth Paved Roads (5-300-5 Hz @ 1 oct/min)

- 1 - 4 Hz @ 0.43 in. D. A. Disp.*
- 4 - 5 Hz @ 0.35 G's peak*
- 5 - 150 Hz @ 0.35 G's peak
- 150 - 300 Hz @ 0.06 G's peak

o All Road Conditions (5-1000-5 Hz @ 1 oct/min)

- 1 - 7 Hz @ 1.7 G's peak*
- 7 - 15 Hz @ 1.7 G's peak
- 15 - 1000 Hz @ 0.7 G's peak

3. Trains

o Normal Railroad Operations (5-2000-5 Hz @ 1 oct/min)

- 2 - 3 Hz @ 2.6 in. D. A. Disp.*
- 3 - 6 Hz @ 1.2 G's peak*
- 6 - 130 Hz @ 1.2 G's peak
- 130 - 185 Hz @ 0.0014 in. D. A. Disp.
- 185 - 2000 Hz @ 2.5 G's peak

4. Ships

o Normal Maneuvers (5-300-5 Hz @ 1 oct/min)

- 0.1 - 0.3 Hz @ 0.35 G's peak*
- 0.3 - 1.5 Hz @ 0.35 G's peak*
- 1.5 - 4 Hz @ 0.10 G's peak*
- 4 - 5 Hz @ 0.12 in. D. A. Disp.*
- 5 - 11 Hz @ 0.12 in. D. A. Disp.
- 11 - 300 Hz @ 0.75 G's peak

B. Shock

Shock tests should be conducted by applying five shocks in each of three mutually perpendicular axes (15 shocks total). Any shock pulse that results in a spectrum as severe as that presented below will be acceptable. The spectrum is based on the response of an undamped series of single-degree-of-freedom spring-mass systems.

* Design Criteria Only — no test required.

1. Railroad

o Car Humping Conditions (5 shocks per axis)

20 - 160 Hz @ +6 dB/oct
160 - 340 Hz @ 500 G's peak
340 - 400 Hz @ -6 dB/oct

SECTION X. HANDLING SPECIFICATIONS

Where equipment design allows, equipment shall be tested to handling specifications as described below. If normal equipment design does not allow this type testing, the procedures and required protection in handling are to be submitted to MSFC, ED23, for approval.

A. Transit Drop Test

This procedure shall be used for equipment, in its transit or combination case as prepared for field use, to determine if the equipment is capable of withstanding the shocks normally induced by loading and unloading of equipment.

B. Test Conditions

The test item shall be in its transit or combination case. For equipment 1,000 lb or less, the floor or barrier receiving the impact shall be of solid, 2-in. thick plywood, backed by either concrete or a rigid steel frame. For equipment over 1,000 lb. the floor or barrier shall be concrete or its equivalent.

C. Performance of Test

Subject the test item to the number and heights of drop as required in Table XI. Upon completion of the test, the test item shall be operated and the results compared with the data obtained in accordance with the following:

Prior to proceeding with any of the test methods, the test item shall be operated under standard ambient conditions and a record made of all data necessary to determine compliance with required performance. These data shall provide the criteria for checking satisfactory performance of the test item either during, or at the conclusion of the test, or both as required. Certification by signature and date block is required.

The test item shall then be visually inspected and a record made of any damage/deterioration resulting from the test. If a test chamber is used for the test, perform a visual inspection of the test item within the chamber at test conditions, when possible. Upon completion of the test, visually inspect the test item again after the test item has been returned to standard ambient conditions. Deterioration, corrosion, or change in tolerance limits or any internal or external parts which could in any manner prevent the test item from meeting operational service or maintenance requirements shall provide reason to consider the test item as having failed to withstand the conditions of the test.

TABLE XI. TRANSIT DROP TEST

Weight of Test Item and Case (lb)	Largest Dimensions (in.)	Notes	Height of Drop (in.)	No. of Drops
Under 100 lb Man-packed and Man-portable	Under 36	A	48	Drop on each face, edge, and corner. Total of 26 drops
	36 and over	A	30	
100 to 200 lb Inclusive	Under 36	A	30	Drop on each corner
	36 and over	A	24	
Over 200 to 1,000 lb Inclusive	Under 36	A	24	Total of 8 drops
	36 to 60	B	36	
	Over 60	B	24	
Over 1,000	No limit	C	18	4 edgewise drops 2 cornerwise drops

Note A. Drops shall be made from a quick-release hook; or drop tester as made by the L.A.B. Corporation, Skaneateles, New York, or equal. The test item shall be oriented so that upon impact a line from the struck corner or edge to the center of gravity of the case and contents is perpendicular to the impact surface.

Note B. With the longest dimensions parallel to the floor, the transit or combination case, with the test item within, shall be supported at the corner of one end by a block 5 in. in height, and at the other corner or edge of the same end by a block 12 in. in height. The opposite end of the case shall then be raised to the specified height at the lowest unsupported corner and allowed to fall freely.

Note C. While in the normal transit position, the case and contents shall be subjected to the edgewise and cornerwise drop test as follows (if normal transit position is unknown, the case shall be oriented such that the two longest dimensions are parallel to the "floor").

1. Edgewise Drop Test. One edge of the base of the case shall be supported on a sill 5 to 6 in. in height. The opposite edge shall be raised to the specified height and allowed to fall freely. The test shall be applied once to each edge of the base of the case (total of four drops).

2. Cornerwise Drop Test. One corner of the base of the case shall be supported on a block approximately 5 in. in height. A block normally 12 in. in height shall be placed under the other corner of the same end. The opposite end of the case shall be raised to the specified height at the lowest unsupported corner and allowed to fall freely. This test shall be applied once to each of two diagonally opposite corners of the base (total of two cornerwise drops). When the proportions of width and height of the case are such as to cause instability in the cornerwise drop test, edgewise drops shall be substituted. In such instances two more edgewise drops on each end shall be performed (four additional edgewise drops for a total of eight edgewise drops).

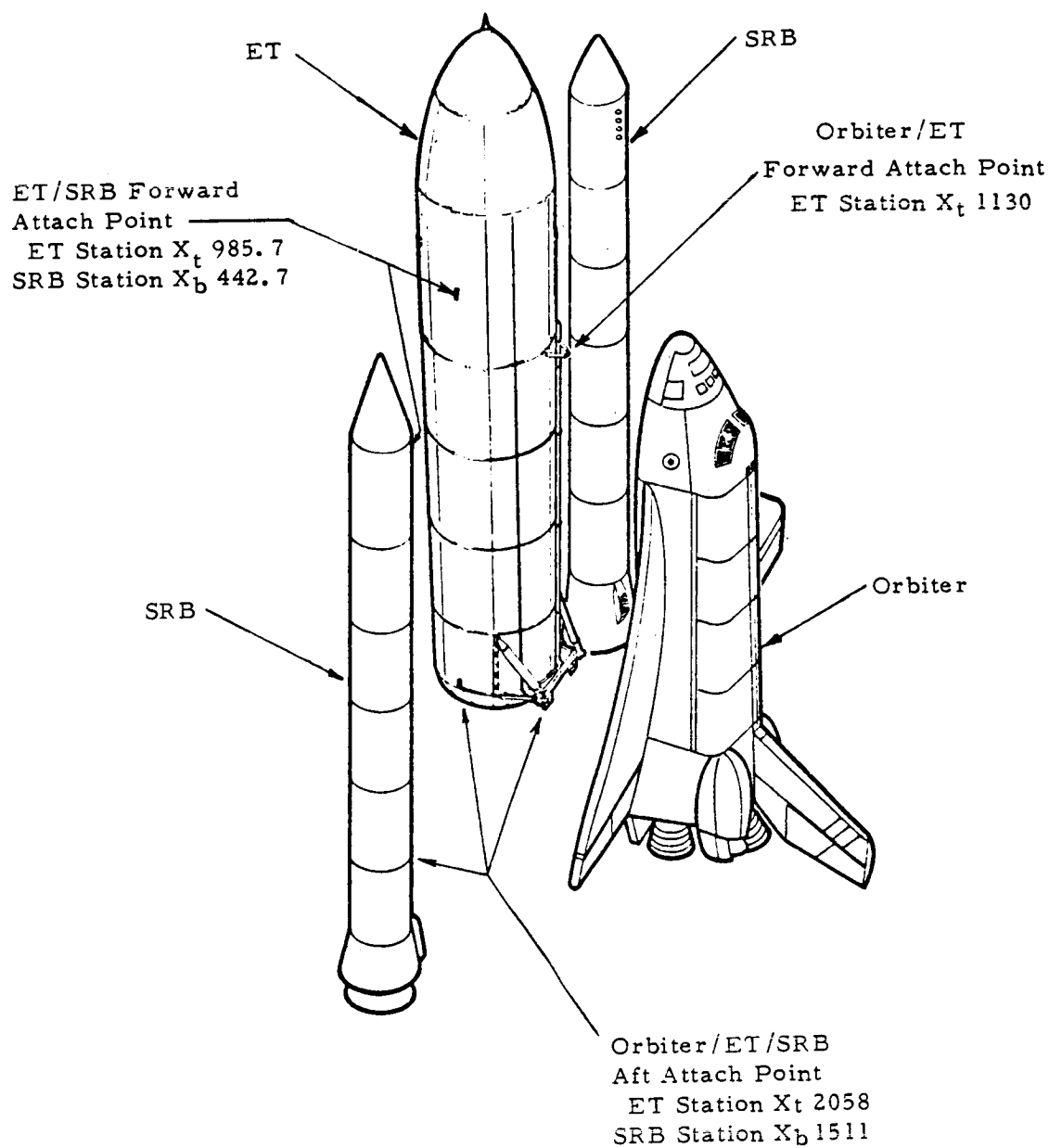


Figure 1. Space Shuttle General Configuration.

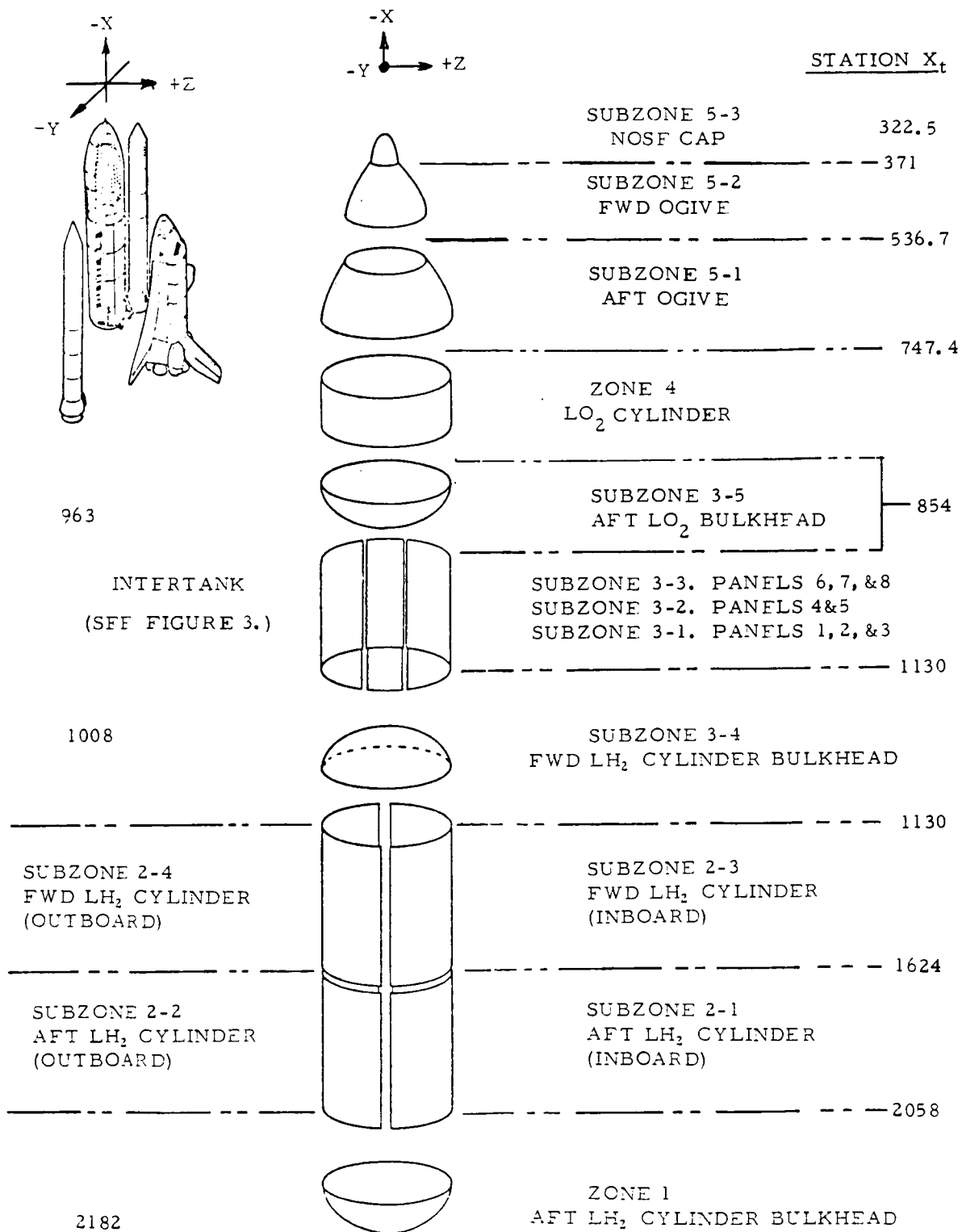


Figure 2. External tank zones.

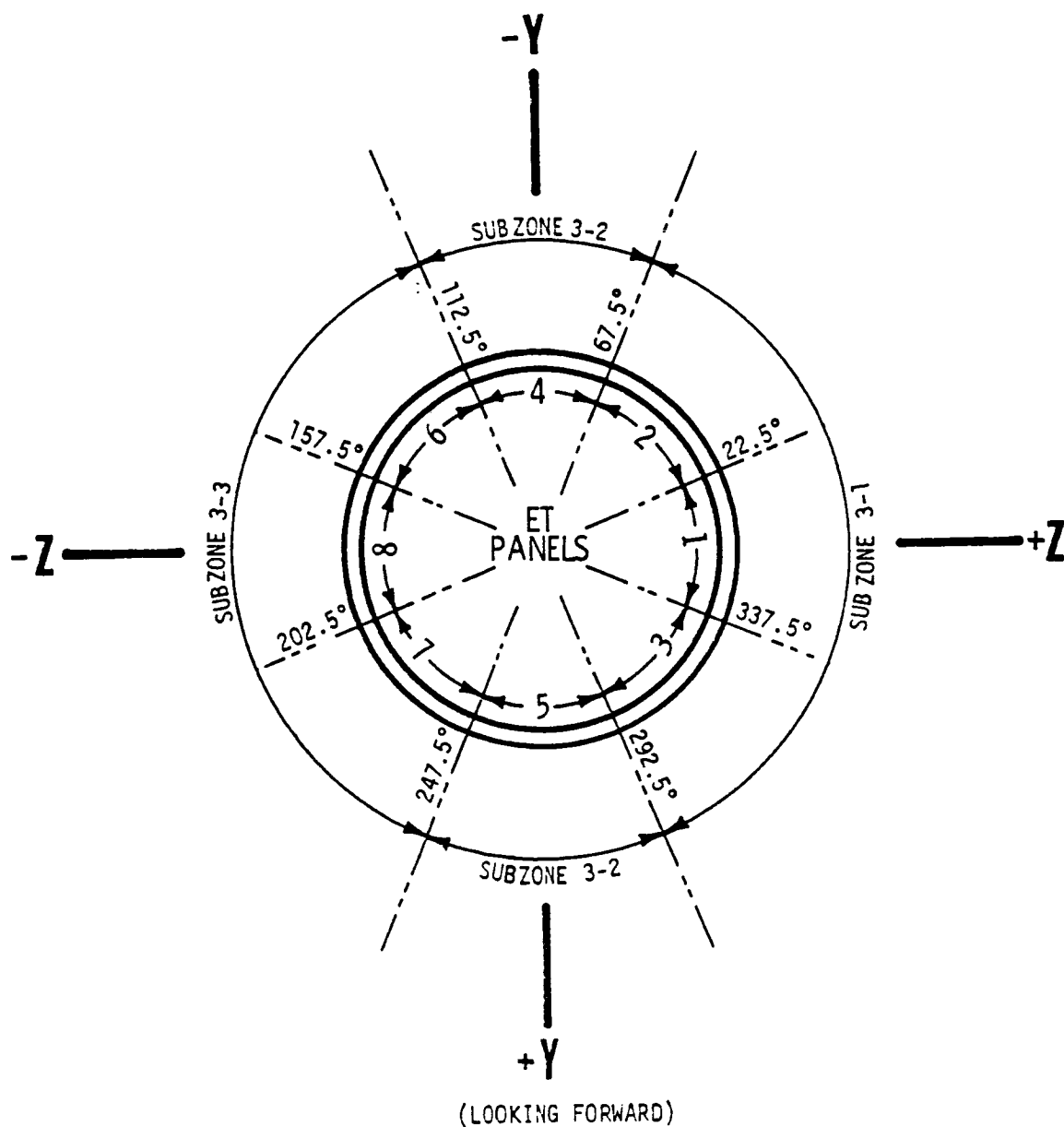


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APPENDIX A

VIBRATION AND SHOCK CRITERIA

FOR

SPECIFIC COMPONENTS

OF THE

SPACE SHUTTLE EXTERNAL TANK

Input to Components Mounted on the Mated Ground Umbilical Carrier Plate in the Intertank (Pre-Separation)

1. Acceptance Test Criteria (1 minute/axis)

Radial Axis

20 Hz @ $0.0025 \text{ g}^2/\text{Hz}$
20 - 39 Hz @ +6 dB/oct
39 - 800 Hz @ $0.0095 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0015 \text{ g}^2/\text{Hz}$

Composite = $3.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.0005 \text{ g}^2/\text{Hz}$
20 - 37 Hz @ +9 dB/oct
37 - 170 Hz @ $0.003 \text{ g}^2/\text{Hz}$
170 - 310 Hz @ +6 dB/oct
310 - 800 Hz @ $0.01 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0016 \text{ g}^2/\text{Hz}$

Composite = $3.3 \text{ g}_{\text{rms}}$

2. Pre-Liftoff Random Vibration Criteria (1 minute/axis)

Radial Axis

20 Hz @ $0.01 \text{ g}^2/\text{Hz}$
20 - 39 Hz @ +6 dB/oct
39 - 800 Hz @ $0.038 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0061 \text{ g}^2/\text{Hz}$

Composite = $6.9 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 Hz @ $0.002 \text{ g}^2/\text{Hz}$
20 - 37 Hz @ +9 dB/oct
37 - 170 Hz @ $0.012 \text{ g}^2/\text{Hz}$
170 - 310 Hz @ +6 dB/oct
310 - 800 Hz @ $0.04 \text{ g}^2/\text{Hz}$
800 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.0064 \text{ g}^2/\text{Hz}$

Composite = $6.6 \text{ g}_{\text{rms}}$

3. Boost Random Vibration Criteria

N/A

4. Vehicle Dynamics Criteria

N/A

5. Shock Test Criteria

See Table I

Input to Range Safety Panel

1. Acceptance Test Criteria (1 min/axis)

Radial Axis

20 - 20 Hz @ $0.033 \text{ g}^2/\text{Hz}$
43 - 43 Hz @ +9 dB/oct
43 - 100 Hz @ $0.33 \text{ g}^2/\text{Hz}$
100 - 123 Hz @ -9 dB/oct
123 - 400 Hz @ $0.175 \text{ g}^2/\text{Hz}$
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.007 \text{ g}^2/\text{Hz}$

Composite = $11.5 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.00065 \text{ g}^2/\text{Hz}$
60 - 60 Hz @ +9 dB/oct
60 - 1300 Hz @ $0.018 \text{ g}^2/\text{Hz}$
1300 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.0048 \text{ g}^2/\text{Hz}$

Composite = $5.3 \text{ g}_{\text{rms}}$

2 and 3. Flight Random Vibration Criteria (3 min/axis)

Radial Axis

20 - 20 Hz @ $0.13 \text{ g}^2/\text{Hz}$
43 - 43 Hz @ +9 dB/oct
43 - 100 Hz @ $1.3 \text{ g}^2/\text{Hz}$
100 - 123 Hz @ -9 dB/oct
123 - 400 Hz @ $0.7 \text{ g}^2/\text{Hz}$
400 - 2000 Hz @ -6 dB/oct
2000 Hz @ $0.028 \text{ g}^2/\text{Hz}$

Composite = $23.0 \text{ g}_{\text{rms}}$

Long. and Tang. Axes

20 - 20 Hz @ $0.0026 \text{ g}^2/\text{Hz}$
60 - 60 Hz @ +9 dB/oct
60 - 1300 Hz @ $0.07 \text{ g}^2/\text{Hz}$
1300 - 2000 Hz @ -9 dB/oct
2000 Hz @ $0.09 \text{ g}^2/\text{Hz}$

Composite = $10.7 \text{ g}_{\text{rms}}$

4. Vehicle Dynamics Criteria

Longitudinal Axis

2 - 5 Hz @ 0.6 G's peak*
5 - 40 Hz @ 0.6 G's peak

Lateral Axes

2 - 5 Hz @ 0.8 G's peak*
5 - 40 Hz @ 0.8 G's peak

5. Shock Test Criteria

See Table I

* Design Criteria Only

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16. ABSTRACT <p>This reports presents the vibration, acoustic and shock design and test criteria for components and subassemblies on the External Tank (ET). Also presented are specifications for transportation, handling, and acceptance testing.</p> <p>The Space Shuttle LWT has been divided into zones and subzones. Zones are designated primarily to assist in determining the applicable specifications. A subzone (General Specification) is available for use when the location of the component is known but component design and weight are not well defined. When the location, weight, and mounting configuration of the component are known, specifications for appropriate subzone weight ranges are available.</p> <p>Included with the specifications are vibration, acoustic, shock, transportation, handling, and acceptance test requirements and procedures. A method of selecting applicable vibration, acoustic, and shock specifications is also included.</p>					
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